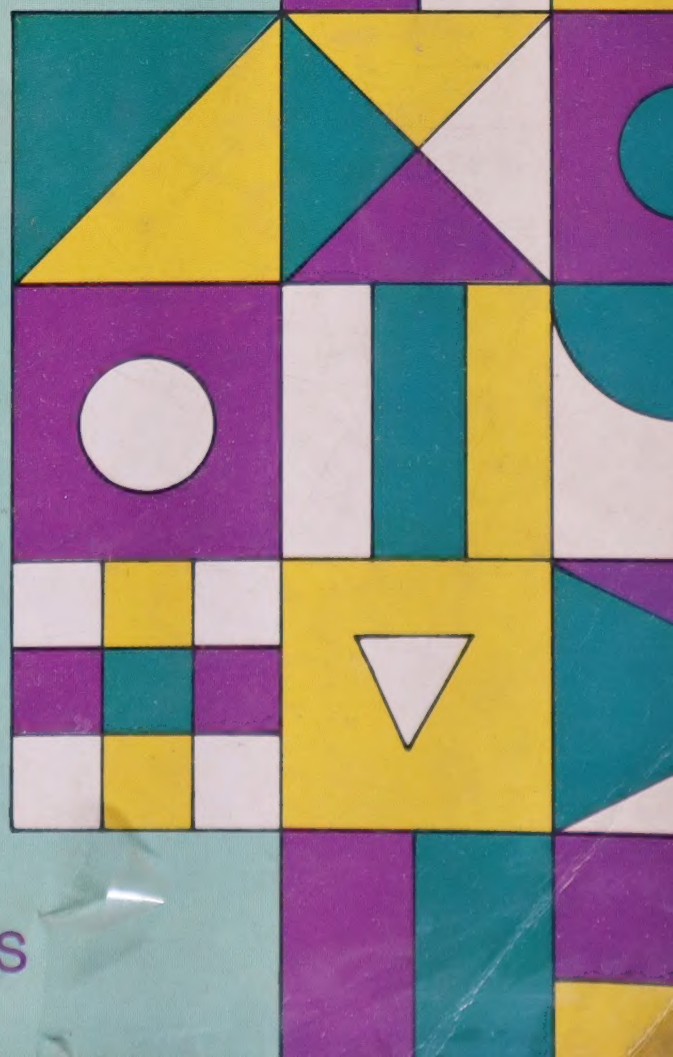


DOS 6 & 6.2 Companion

Satish Jain

- Double your Hard Disk capacity
- Protect the Computer from Virus
- Networking without extra cost
- Optimize the memory use
- Work with a mouse & CD ROM



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DOS Commands by Function

Function	Command to Use
Allow old Programs to work with DOS6	SETVER, LOADFIX
Analyze a hardware configuration	MSD
Back up data	MSBACKUP, RESTORE
Change a disk's volume label	LABEL
Change a file name	REN, RENAME
Change or create disk partitions	FDISK
Change file attributes	ATTRIB
Change the communications port setting	MODE
Change the current subdirectory	CD, CHDIR
Change the date	DATE
Change the DOS prompt	PROMPT
Change the size of environment space	SHELL
Check a disk for errors	CHKDSK
Clear the screen	CLS
Compare two files	FC
Compare two floppy disks	DISKCOMP
Compress data files	DBLSPACE
Configure the system	MEMMAKER
Copy an entire floppy disk	DISKCOPY
Copy files	COPY
Create a disk drive letter	SUBST
Create a new subdirectory	MD, MKDIR
Create a memory variables	SET
Defragment files	DEFRAG

Legend
4/10/94

Function	Command to Use
Delete a file	DEL, ERASE
Display information about RAM	MEM
Display the contents of ASCII file	TYPE
Display the DOS version number	VER
Display the subdirectory structure	TREE
Edit ASCII files	EDIT
Edit executable files	DEBUG
Erase a file	DEL, ERASE
Erase an entire disk or directory	DELTREE
Find a character string in a file	FIND
Find files in other subdirectories	APPEND, PATH
Format a blank disk	FORMAT
Get help with DOS	DOSHELP, HELP, /?
Install a foreign character set	CHCP, COUNTRY, KEYB, MODE, NLSFUNC, SELECT
Install DOS on hard or floppy disk	SYS
List files on a disk or subdirectory	DIR
Load DOS in High Memory Area	DOS
Load programs in memory	DEVICE, DEVICEHIGH, INSTALL, LH, LOADHIGH
Move files to a different subdirectory	MOVE
Pause screen scrolling	MORE
Place comments in system or batch files	REM

DOS 6 & 6.2 COMPANION

SATISH JAIN

Wing Commander (Retd)

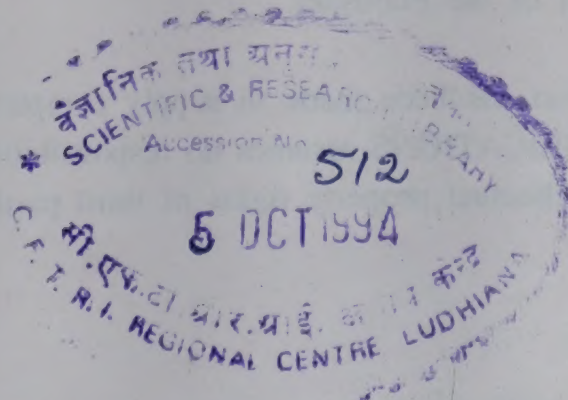
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Dedicated to the

memory of

my friend

Late Wing Commander R.C. Lala

Philosopher, Friend and Guide

President of the

Board of

my friend

Late Wing Commander R.C. 1st

Philosophy, Friend and Guide

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(SATISH JAIN)

21st March, 1994

Wing Commander (Retd.)

PREFACE

DOS 6 & 6.2 companion is basically designed to meet the evolving needs of IBM PC users. The companion is written in a simple and logical manner and therefore users will find it very easy to follow.

The companion gives an insight of DOS 6 & 6.2 as described in Chapter 1 to Chapter 15.

A set of appendices is added to make this companion modular and comprehensive. First time users of DOS will find these appendices very useful because they can know all about the secrets of DOS 6 and DOS 6.2.

Hard disk forms an important part of IBM PC XT system to store and process large amount of data and hence management of hard disk is important for effective use of IBM PC XT and AT systems. Chapter 8 deals with hard disk mainly.

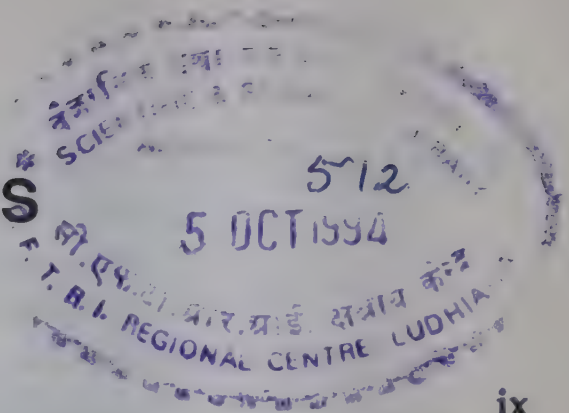
For the latest developments in DOS 6 & 6.2, we have included the installation of DOS version 6 & 6.2 in Chapter 13.

Chapter 14 is added to give the capability of networking to your IBM PC/AT system using DOS 6 & 6.2. Chapter 15 exclusively deals with virus and its removal.

The author would be obliged to the readers for criticism and valuable suggestions to improve this companion.

SATISH JAIN
Wg. cdr(Rtd)

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Chapter 1

WHAT AND WHY OF DOS 6 ?

WHAT IS DOS 6 ?

DOS 6 is a "real mode" operating system supplied by Microsoft Corporation of U.S.A. It includes a number of utilities that have become common place on most PCs; disk compression, memory management, anti-virus, backup, disk optimization. Earlier these utilities were bought separately from third party vendors who were selling them long before DOS 6. So Microsoft has licensed popular utilities from third-party vendors and included them with the DOS 6.

WHY DOS 6 ?

Easy Installation

You have a choice of installation methods. Automatic mode and maintenance mode. The maintenance mode lets you install the optional components at a later time without having to reinstall the whole package.

Disk Compression (Double Disk Capacity)

Microsoft has introduced disk compression software in DOS 6. DoubleSpace is a transparent disk compression software like Stacker. Each of these software installs a device driver on your system. It then creates a hidden file on your disk and "mounts" it as a virtual drive. When you read from this virtual drive, the device driver reads the appropriate disk sectors within the hidden file, uncompresses them, and passes them onto you.

DOS 6 integrates disk compression to make it a part of the operating system kernel. The DoubleSpace device driver is stored on system disks along with IO.SYS and MS-DOS.SYS. It is loaded early in the boot process, before CONFIG.SYS processing begins.

Double Space utility of DOS 6 does not have an uninstall facility. So to remove it you'll have to backup the DoubleSpace drive before deleting it. The DIR command has an additional /C option that lets you display compression ratios for files stored on a DoubleSpace disk. By this method, you are able to store

80 MB data on a 40 MB hard disk and save large amount of money.

Disk Optimization

To reduce the idle time of a CPU when reading or writing to a disk, SmartDrive caches your disk. Memory or RAM access is much faster than disk access, so SmartDrive speeds up your disk by storing the most frequently accessed regions of the disk in memory. When DOS requests a read from a disk, SmartDrive reads in those sectors and the next few sectors as well. The next time DOS requests a read, SmartDrive notes that the information is already in memory and it simply transfers the data from its buffer to the DOS buffer.

Another feature of SmartDrive is delayed write or write caching. Under DOS, most of the time the CPU is idle. Thus, rather than keep a user from waiting during a long disk write, SmartDrive writes the data to its cache. The user can then continue working while SmartDrive writes data to the drive in the background. Of course, should the computer crash before SmartDrive has transferred all the data, the data is lost.

Files on a DOS drive become fragmented when contents of the file are stored in non-contiguous areas of the drive. This slows down drive as it requires more movement of the disk drive head. Defragmentation speeds up your disk by reorganizing the physical placement of the files so that each file occupies a single contiguous region of the disk. DOS and Smart Drive can then read the file much faster. The DEFRAG program in DOS 6 defragments your hard disk. The program is a subset of the popular Norton Speedisk program, with advanced features missing. It supports both DoubleSpace drives and uncompressed drives.

File Undelete and Backup

DOS 6 comes with a classy menu-driven backup program which makes the complex operation of backing up your data, straightforward and simple. It includes error correction and compression too! There are three types of backups supported. Full backup saves all files you select, Incremental backup saves files changed since the last backup and any added files that match your selection, Differential backup saves changes since the last full backup and any added files which match your selection.

Restoring your files is equally painless. Once they're backed up, you ask the program to compare or restore them. If you have a series of incremental or differential backups, which have multiple versions of the same file, you can select from a menu of different versions for comparing and restoring.

If you are prone to accidentally deleting your files, DOS 6 has file undelete.

DOS 6 includes a File Manager extension to undelete files. It adds a new level of delete protection called sentry undelete, which copies deleted files to a hidden directory. Thus, files can be undeleted without restriction, if they haven't been purged to make room for other files. Directories can also be undeleted with DOS 6.

Memory Management

To take advantage of most of the new memory management capabilities of DOS 6, you need a IBM PC AT 386. To optimize the use of memory, DOS 6 includes MEMMaker, which seeks out unused upper memory and checks to see what is currently loaded. Then it tries to load devices and programs into upper memory so that you can have more base memory. It keeps on trying until it hits upon a good solution.

In DOS 6, MSD (Microsoft System Diagnostics) display memory map information as well as a detailed system profile. This handy tool was also supplied with Windows 3.1. The Mem command has two new options - /Free to display unused memory and /Module to display memory used by a specific program.

Anti-Virus

Microsoft Anti-Virus provides both active and passive protection against hundreds of known viruses and their variants. Both Windows and DOS versions have been included. The Windows version supports Drag and Drop, so you can drag files into MSAV for virus checking.

A TSR, VSAFE.COM, can be loaded for active protection. This checks all files for viruses as they are opened, copied or executed. If a virus is detected, an alarm will sound, and a window will appear.

Enhanced Config.sys and Batch Commands

If you have ever tinkered around with your CONFIG.SYS, you already know the golden rule: "Keep a spare boot floppy before you start". DOS 6 does away with that. Just keep F5 pressed during bootup, and the CONFIG.SYS and AUTOEXEC.BAT are skipped. Among the new commands added to CONFIG.SYS is a command to turn on/off NumLock and another that places variables in the DOS environment.

CHOICE is a new batch command which prompts the user to make a choice in a batch file. CHOICE "Want to backup" shows up as "Want to backup [Y, N]?" when the batch file is run.

4 *Dos 6 & 6.2 Companion*

In the CONFIG.SYS you can now manage multiple configuration files and choose one from a menu during startup. So you can store custom configurations for different users.

HELP

DOS 6 includes a new help system based on QuickBasic's help. The full-screen help acts like an online MS-DOS reference. It also provides syntax, examples and notes. All commands still support the `/?` switch. Online help is available most of the time and in many cases easier to look up than the volumes. The HELP command of MS-DOS 5 is called DOSHELP in DOS 6.

Windows Support

DOS 6 integrates well with Windows. The Backup, Antivirus, and Undelete tools have their Windows counterparts and are accessible from icons in a Microsoft Tools program group created during setup. You can see compression ratios from the File Manager's new Tools menu, but to run any DoubleSpace utility you have to drop down to DOS. One of the nicer utility is a SmartDrive monitor (SMART-MON) that monitors SmartDrive within Windows.

Additional Features

To delete an entire subdirectory tree, you can use DelTree. You can move files or rename directories using MOVE. Also included is INTERLNK and INTERSVR which allow you to share files between two computers connected by a parallel or serial cable. Laptop users with APM (Advanced Power Management) systems can extend their battery's life with POWER.

Chapter 2

DOS 6 TUTOR

WHAT IS DOS 6 ?

DOS 6 is an operating system for the IBM PC and PC - compatibles micro computers. An *operating system* is the overseer of the computer. In general, an operating system is a collection of the programmes that manage system resources and aid in the development and execution of application programs. DOS stands for *Disk Operating System*. DOS is your interface to the computer.

Many users are confused by the terms PC-DOS and MS-DOS. Essentially, the two systems are identical. PC-DOS is the IBM implemenatation of DOS. MS-DOS is the Microsoft version of DOS. IBM and Microsoft have gone to great lengths to ensure that the two systems are functionally identical. Several other operating systems exist for the IBM PC, such as XENIX, UNIX, and CP/M. The point to remember is that DOS-6 is here to stay for long time.

Diferent Dos Versions

Every operating system has a version number that allows you to keep track of whether or not the software you are running is the latest version and also of the current capabilities supported by different versions. DOS 1.0 was originally released by IBM and Microsoft in 1981 to support the IBM PC. This version of DOS provided the basic functions required to develop and execute programs on the PC, along with the ability to perform simple file manipulations.

Each version number is broken down into two parts, a major and minor version number. In the case of DOS version 1.0, for example, 1 is the major version number, while 0 is the minor version number. Most software package developers use version numbers as follows:

If the software package introduces significant upgrades in terms of functionality, they will increment the major version number. DOS 1.0 becomes DOS 2, if the software package fixes known bugs from the previous version or introduces only minor changes in functionality, they will increment the minor version number. For example DOS 1.0 will become DOS 1.1

HOW TO SWITCH ON YOUR SYSTEM ?

Once you get your system put together and all of your cables are in place, it is

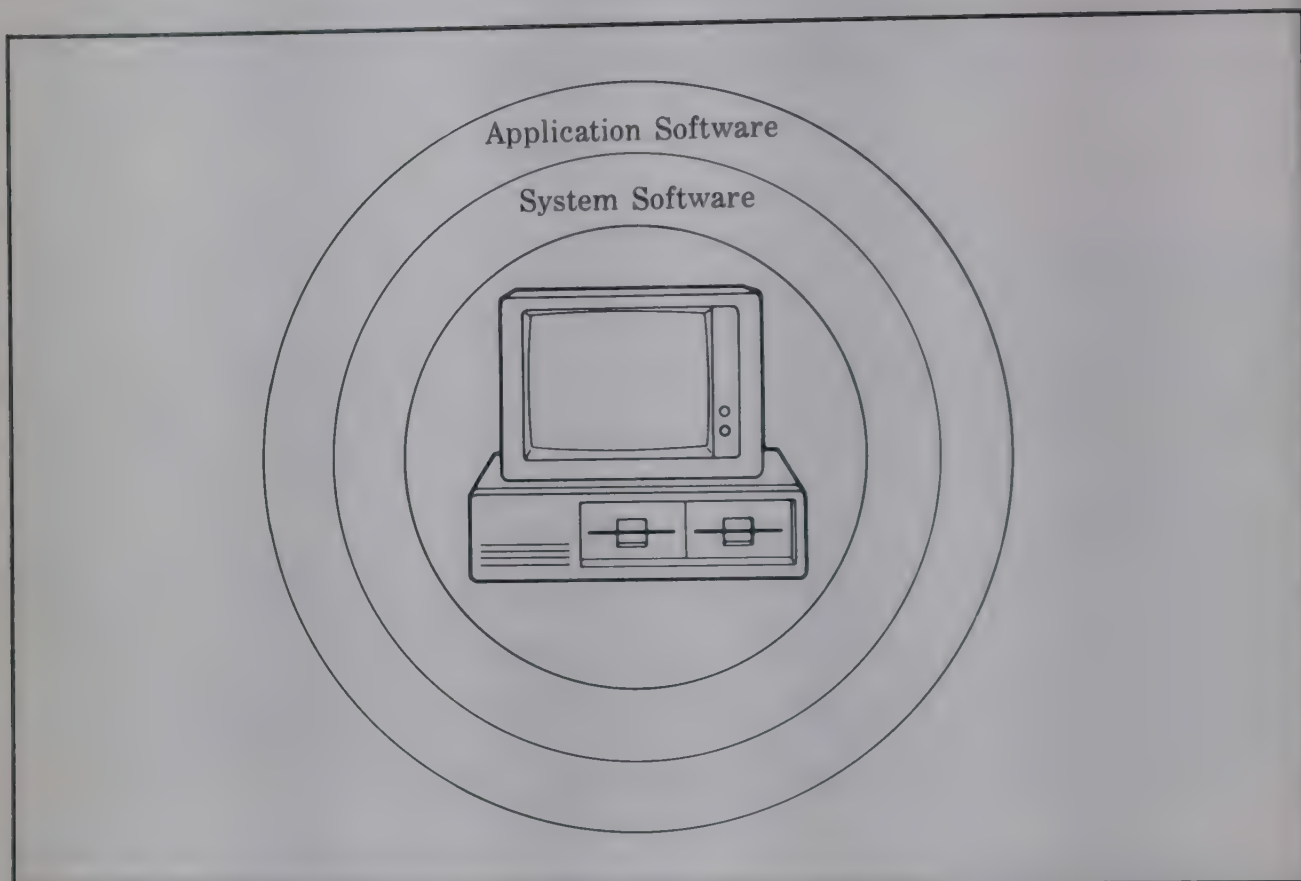


Fig. 2.1 Relationship between application and system software

time to switch on your computer. First, examine how your system is set up? If you have all plugs in one outlet via multiple-plug adapters, do not switch on the system. Instead, go to a computer or electronics shop and purchase a power strip or box similar to those shown in Figure 2.2. As you will find, there are two types of power distribution strips. The first, and least expensive, simply allows you to distribute the wires neatly. This is definitely an improvement over multiple-plug outlets, but it provides little protection for your computer against power surges.

Many power strips also provide surge suppression. Once the power coming across the wires reaches a certain threshold, a breaker within the strip trips, and the power surge does not reach the computer. This small investment can protect the computer and software that you just spent several thousand rupees on. One such power distribution box sits under the monitor as shown in Figure 2.3. This particular box allows you to switch on and off individual components of your computer while providing surge suppression against power strikes.

Once you are satisfied with your power supply configuration, switch on your computer. The computer will begin its power-on diagnostics. During this

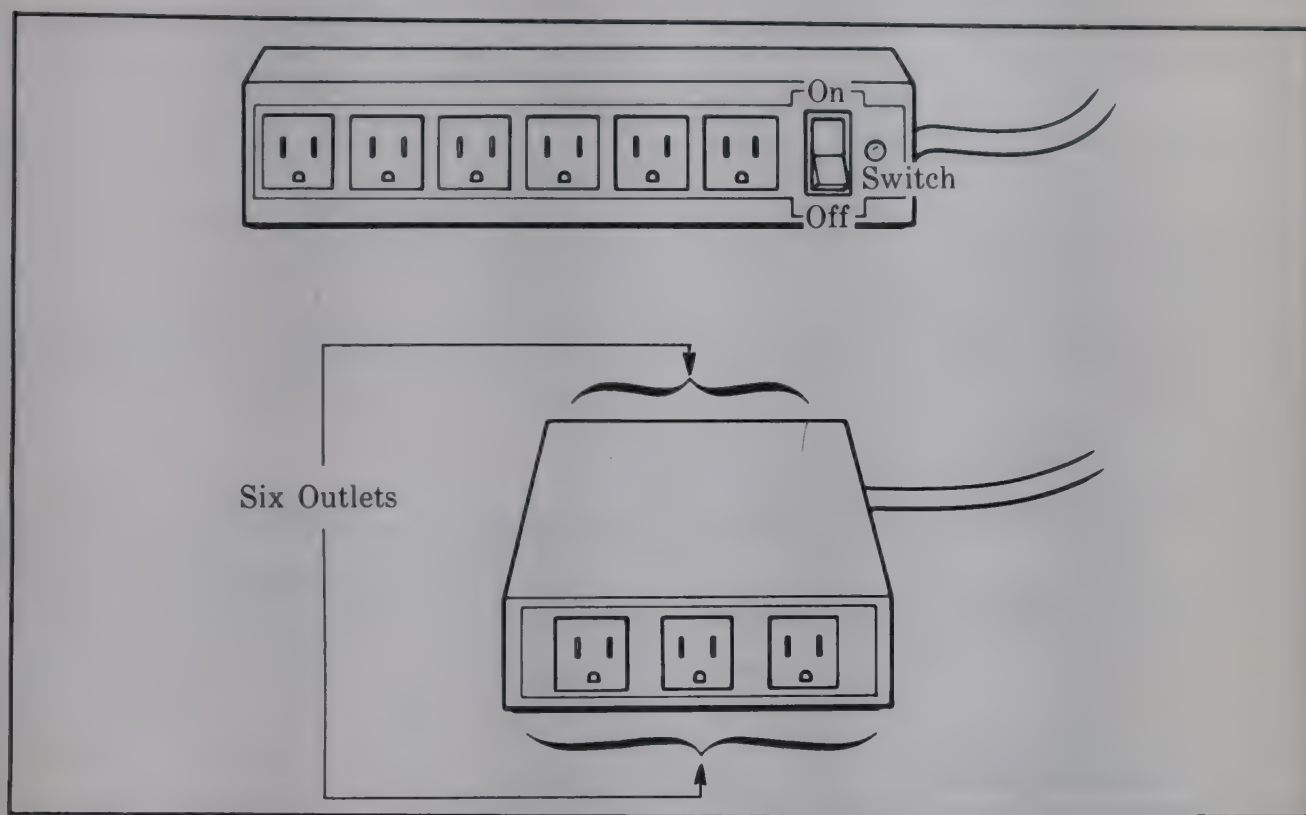


Fig. 2.2 Sample power strips

time, the computer will check out most of its critical hardware components and display the amount of memory present in the system.

WHAT IS COMMAND PROMPT?

When you first switch on IBM PC computer, you will see some coded information displayed by DOS 6. This information tells the configuring of your computer. When the information stops you will see the following:

```
C:\> _
```

This is the *command prompt*. The flashing underscore next to the command prompt is called the *cursor*. The cursor shows the place on the screen where the command will appear as you type it.

If the command prompt does not look like the one shown above, type the following at the command prompt, and then press ENTER:

```
cd\
```

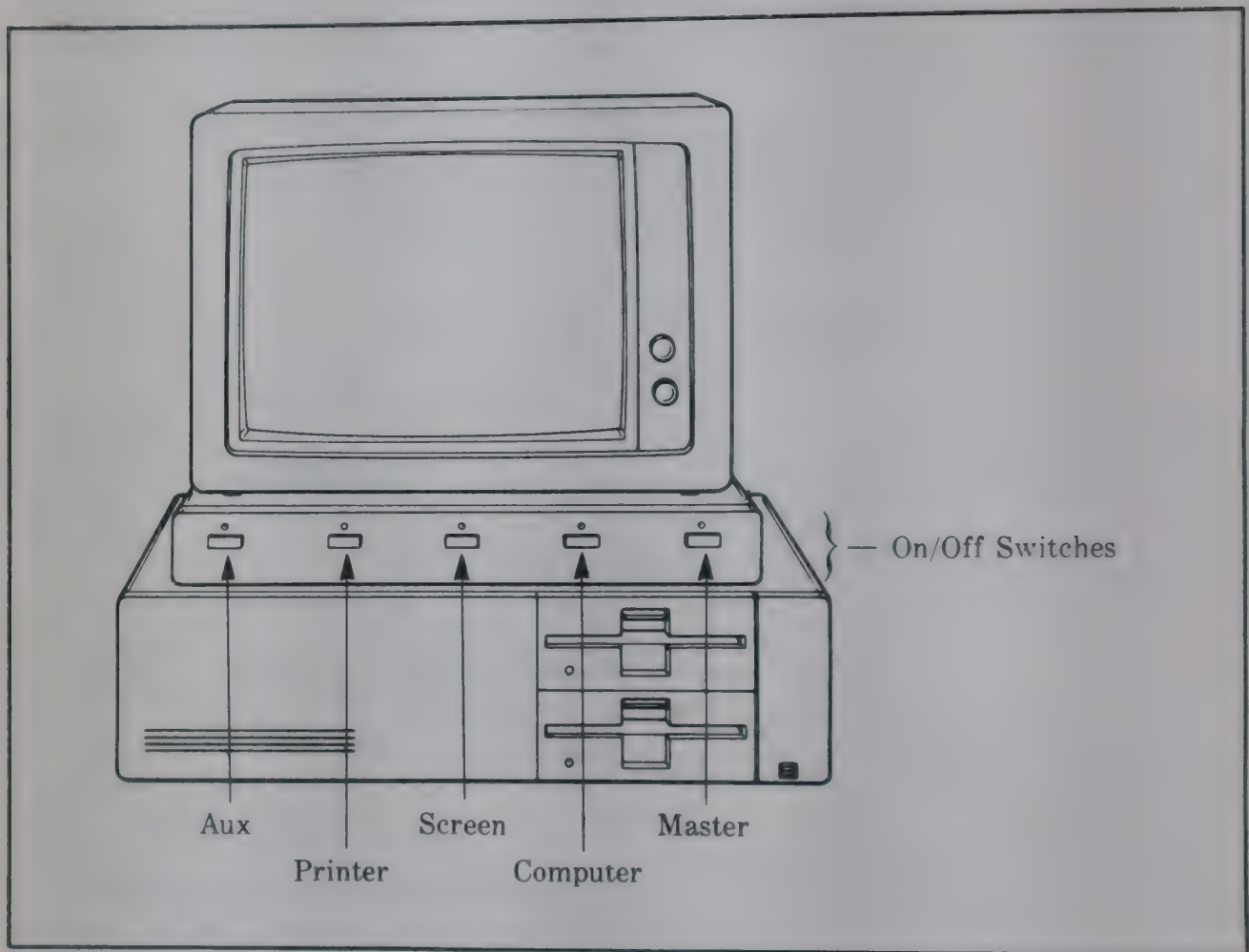


Fig. 2.3 Distribution box that sits under monitor

Type the following at the command prompt, and then press ENTER key.

Prompt \$p\$g

Your command prompt should now look like:

C:\>

GIVING A COMMAND TO YOUR SYSTEM!

Type the following command at the command prompt and then press ENTER key.

ver

The following message should appear on your screen:

```
MS-DOS version 6.00
```

The *ver* command displays the version number of MS-DOS.

THE DIRECTORY COMMAND!

The *dir* command stands for "directory"

Type the following at the command prompt and press ENTER key.

```
dir
```

A list similar to the following appears:

```
Volume in drive c is MS-DOS_6
```

```
Volume serial Number is BPB
```

```
Directory of C:
```

WINDOWS	<DIR>	09-08-93	10:27p
TEMP	<DIR>	05-15-93	12:09p
CONFIG	SYS	278	09-23-93 10:50a
COMMAND	COM	53014	09-18-93 6:00a
DOS	<DIR>	09-02-93	4:23p
AUTOEXEC	BAT	290	09-23-93 10:54a
6 file (s)		52582 bytes	
		8732672 bytes free	

This is a list of the *directory*. A directory list is a list of all the files and subdirectories that a directory contains. In this case, you see all the files and directories in the main or root directory of your drive. All the files and directories on your drive are stored in the root directory.

HOW TO CHANGE DIRECTORIES?

The names that have <DIR> beside them in the list are directories. If you want to see a list of the files in another directory you will have to change to that directory, and then using the *dir* command you can see files. So to change to the DOS directory do the following:

Before you begin, make sure you have a directory named DOS by carrying out the following procedure.

1. Look through the directory list on your screen for a line that looks similar to

the following:

```
DOS          <DIR>      09-02-93   4:23p
```

2. If you see a line like this, you have a directory named DOS.

To change to DOS directory, you will use the *cd* command. The *cd* command stands for "change directory".

Type the following at the command prompt and press ENTER key.

```
cd dos
```

The command prompt changes. It should now look the following:

```
C:\DOS>
```

The command prompt shows which directory you are in. In this case, you know that you have successfully changed to the DOS directory because the command prompt displays the directory's name. Now the current directory is DOS.

Next, you will use the *dir* command to view a list of the files in the DOS directory. Type the following at the command prompt:

```
dir
```

A list of the files in the DOS sub-directory will appear, but scrolls too quickly to read. You can modify the *dir* command so that it displays only one screen of information at a time. To do so do the following.

1. Type the following at the command prompt and press ENTER key.

```
dir/p
```

One screen of information appears. At the bottom of the screen, you will see the following message:

```
press any key to continue...
```

2. To view the next screen of information, press any key on your keyboard. Repeat this step until the command prompt appears at the bottom of your screen.

When you typed the *dir* command this time, you included the */p* switch after the command. A *switch* modifies the way DOS 6 carries out a command. A switch consists of a forward slash (/) that is followed by one or more letters or numbers. When you used the */p switch* with the *dir* command, you specified that DOS 6 should pause after it displays each screen of directory list of information.

Another helpful switch you can use with the *dir* command is the */w* switch. The */w* switch indicates that MS-DOS should show a wide format version of the directory list. For this do the following:

1. Type the following at the command prompt and press ENTER key.

```
dir/w
```

The directory list appears, with the filenames listed width wise on the screen. In this case only filenames are listed. Information about the files' size or date and time of creation will not appear.

2. If the directory contains more files than will fit on one screen, you can also combine the */p* and */w* switches as follows:

```
dir/w/p
```

HOW TO CHANGE BACK TO THE ROOT DIRECTORY?

You can change from the DOS directory to the root directory. For this do the following:

1. Type the following at the command prompt and press ENTER key.

```
cd\
```

Note that the slash you type in this command is a backslash (\), not a forward slash (/).

No matter which directory you are in, this command always returns you to the root directory of a drive. The root directory does now look like the following:

```
C:\ >
```

You are now in the root directory.

HOW TO CREATE A SUB-DIRECTORY ?

Creating a sub-directory is helpful when you want to store related files into groups to find them easily. Make sure that the command prompt looks like the following:

```
C:\ >
```

To create a sub-directory, you will use the *Md* command. The *Md* command stands for "make Directory".

1. Type the following at the command prompt and press ENTER key.

Md BPB

You have now created a directory named BPB. You won't see the new BPB sub-directory until you carry out the *dir* command in the next step.

2. To confirm that you successfully created the BPB directory, type the following at the command prompt and press ENTER key.

dir

You will now see entry somewhere in the list similar to the following:

```
BPB          <DIR>          09-25-93   12:09p
```

3. To go into the new sub-directory BPB, type the following at the command prompt:

cd BPB

Command prompt should now look like the following:

```
C:\BPB
```

You can also create a sub-directory within the BPB directory, named salary.

1. Type the following at the command prompt and press ENTER key.

Md salary

You will not see the new salary sub-directory until you carry out the *dir* command in the next step.

2. To confirm that you successfully created the salary sub-directory, type the following at the command prompt:

dir

A list similar to the following appears:

```
Volume in drive C is Ms-DOS_6
Volume serial Number is BPB
Directory of C: \ BPB

                <DIR>          09-25-93          12:08p
                <DIR>          09-25-93          12:08p
SALARY          <DIR>          09-25-93          12:10p
                3 file(s)                        0bytes
                                   11534336        bytes free
```

Note that there are three entries in the BPB directory. One is the SALARY directory that you just created. There are two other entries-one looks like a single period(.) and the other looks like a double period(..). These directory entries are important to DOS 6, but you can ignore them. They appear in every directory.

The SALARY directory is a sub-directory of the BPB directory. A sub-directory is a directory within another directory. Sub-directories are useful to sub-divide information.

3. To change to the SALARY directory, type the following at the command prompt and press ENTER key.

cd salary

The command prompt should now look like the following:

```
C:\BPB salary
```

4. To switch back to the BPB directory, type the following and press ENTER key.

cd..

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The command prompt should now look like the following:

```
C:\BPB
```

When the *cd* command is followed by two periods (..), MS-DOS moves one level up in the directory structure. Thus, moved from the salary sub-directory to the BPB sub-directory.

HOW TO REMOVE A SUB DIRECTORY ?

You will now delete the salary sub-directory. Make sure that the command prompt looks as follows:

```
C:\BPB
```

To delete a sub-directory, use the *rd* command. The *rd* command stands for "remove directory." But make sure, there are no files in that sub-directory. If a file exist, remove it by using *del* command. Then take the following steps:

- (1). Type the following at the command prompt and press ENTER key.

```
rd salary
```

- (2). To confirm that you successfully deleted the SALARY directory, type the following at the command prompt and press ENTER key.

```
dir
```

The Salary directory should not be displayed in the list of directory.

You cannot delete a sub-directory if you are in it. Also you can delete a sub-directory, only if it is empty.

How To Shift To A Different Drive ?

Shifting drives is useful when you would like to work with files that are on a different drive. If you have more than one drive you can use them to store

information. For example, drive A is your first floppy disk drive. The files and directories on drive A are located on floppy disk in this drive. (you might also have a drive B, which contains the files and directories stored on the floppy disk in that drive).

1. Insert setup Disk 1 or a formatted disk in drive A with the label side up. Close the drive door.
2. Type the following at the command prompt and press ENTER key.

a:

The command prompt will change to the following:

A:\>

There must be a floppy disk in the drive that you want to change to.

3. To view a list of the files on the floppy disk in drive A, type the following at the command prompt and press ENTER key.

dir

A list of the files on the disk appears.

4. Change to drive C if you have a hard disk by typing the following at the command prompt and press ENTER key.

C:

Your command prompt should return to the following:

C:\BPB

When you type a drive letter followed by a colon, you change to that drive. The drive letter that appears in the command prompt shows which drive is the current drive. Unless you specify otherwise, any commands you type are carried out on the current directory.

So far, all the commands you typed were carried out on the current drive. For example, you can view the files on a disk in drive A without switching to drive "a" by following this procedure.

Type the following at the command prompt and press ENTER key.

dir a:

A list of the files on the floppy disk in drive A appears, even though your command prompt indicates that drive C is current.

By specifying *a:* after the *dir* command, you are giving MS-DOS additional information. You are indicating that you want the *dir* command to show the list of files and directories on drive A instead of drive C.

Following procedure gives another example. If you want to see the contents of the DOS sub-directory on drive C type the following command and press ENTER key.

```
dir C:\dos
```

A list of the files in the DOS directory on drive C would be displayed on the monitor. The *C:\dos* specifies that you want MS-DOS to display the contents of the DOS directory on drive C, even though your command prompt indicates that the BPB directory is current.

TO COPY FILES FROM ONE DRIVE TO ANOTHER

Copying files means to create a duplicate of the original file and not to remove the original file. If you want to work on a document at home, you can copy it from your computer in the office to a floppy disk and then take this disk to your home.

In order to copy a file, you will use the copy command. When you use the copy command, you must include two parameters. The first is the location and name of the file you want to copy, or the source. The second is the location to which you want to copy, or the destination. You separate the source and destination with a blank space. Thus the command will be:

Copy source destination

Suppose you want to copy the EDIT.HLP and COM files from the DOS directory to the BPB directory; you will specify the source and destination of these files. Make sure you have the following display on the screen:

```
C:\BPB
```

Now To Copy the EDIT.HLP and COM files from the DOS sub-directory to BPB

sub-directory, do the following:

- (1) Return to the root directory by typing the following at the command prompt and press ENTER key.

```
cd\
```

The command prompt should now look like the following:

```
C:\>
```

- (2) Change to the DOS sub directory by typing the following and press ENTER key.

```
cd dos
```

The command prompt should now look like the following:

```
C:\DOS>
```

- (3) Make sure the file you are going to copy, EDIT.COM, is available in the DOS sub-directory. You may give the dir command followed by a EDIT.COM to make sure that EDIT.COM file is in the DOS sub-directory. So type the following and press ENTER key.

```
dir edit.com.
```

A list similar to the following appears:

```
Volume serial Number is BPB
Directory of C:\DOS
EDIT COM  413  09-25-9  5:a
          3
1 file(s)      413      bytes
          13999232  bytes free
```

This shows that the EDIT.COM file is located in the DOS sub-directory.

- (4) To copy the EDIT.COM file from the DOS sub-directory to the BPB sub-directory type the following command and press ENTER key.

```
copy c:\dos\edit.com c:\BPB
```


The following message appears:

```
1 file(s) copied
```

By specifying C:\DOS\EDIT.COM as the source, you indicated that MS-DOS would find the source file EDIT.COM on drive C in the DOS sub-directory. By specifying C:\ as the destination, you indicated that MS-DOS should place the copy of EDIT.COM on drive C in the BPB sub-directory.

(5) Next, you will copy the EDIT.HLP file to the BPB sub-directory.

To copy the EDIT.HLP file from the DOS directory to the BPB sub-directory, type the following and press ENTER key.

Copy edit.hlp \ BPB

The following message appears:

```
1 file (s) copied
```

If the following message appears:

```
Access denied
```

Type the command again and leave a space before BPB.

(6) To confirm the copied files, view the contents of the BPB directory by typing the following at the command prompt and press ENTER key.

Dir\BPB

You should see the two files listed in the BPB sub-directory.

HOW TO COPY A GROUP OF FILES?

You can also use wildcards to copy files from the DOS directory to the BPB directory. In a card game, a wildcard matches any card in the deck. In DOS 6, the character asterisk (*), like a wildcard matches any character in that position and all the other positions, that follow it. If you want to copy a group of files with similar names, using wildcards is easier than copying each file individually.

You can first view a group of files by using wildcards, and then copy the files using wildcards. Your command prompt should look like the following:

```
C:\DOS>
```

In order to list all files ending with the extension TXT and copy them from the DOS

directory to the BPB directory by using wildcards, do the following:

- (1) Type the following at the command prompt and press ENTER key.

```
dir *.txt
```

Note that there is a space before the asterisk(*), but not after it.

This command will list all files and sub-directories in the current directory that end with the extension TXT. The asterisk matches the first character of the file-name and all other characters that follow it, up to the period(.) that separates the name from the TXT extension.

A list similar to the following appears on the screen:

```
Volume in drive C is MS-DOS_6
Volume serial Number is BPB
Directory of C:\DOS
UPGRADE  TXT           8470  11-11-93  5:00a
USEME    TXT           4000  11-11-93  5:00a
README   TXT          10858  11-11-93  5:00a
          3 file(s) 22528 bytes
```

This command lists all the files that end with a TXT extension.

Next, you will copy all the files with a TXT extension to the BPB directory by using wildcards.

- (2) To copy the files with a TXT extension to the BPB directory, type the following and press ENTER key.

```
Copy *.txt\BPB
```

This comand copies all the files that have the TXT extension from the current sub-directory (DOS) to the BPB sub-directory.

- (3) To check the copied files change to the BPB sub-directory by typing the following and press ENTER key.

```
cd\BPB
```

- (4) To view a list of all the files in the BPB sub-directory, type the following at the command prompt and press ENTER key.

```
dir
```

A list similar to the following appears:

Volume in drive C is MS-DOS_6

Volume serial Number is BPB

Directory of C:\BPB

		<DIR>	09-27-93	11:11p
		<DIR>	09-27-93	11:11p
EDIT	COM	413	11-11-93	5:00a
EDIT	HLP	27898	11-11-93	5:00a
UPGRADE	TXT	8470	11-11-93	5:00a
USEME	TXT	4000	11-11-93	5:00a
README	TXT	10085	11-11-93	5:00a
		7 file(s)	40839 bytes	
			40652800 bytes free	

The EDIT.COM and EDIT.HLP files are the files you had copied. The files with TXT extension are the ones you just copied by using the wildcard.

REMOVING FILES FROM DIRECTORY

To remove a file, you can use the *del* command. The *del* command stands for "delete". Before you begin, ensure that your command prompt looks like the following:

```
C:\BPB>
```

To delete the EDIT.COM and EDIT.HLP files

- (1) Delete the EDIT.COM file by typing the following:

```
DEL EDIT.COM
```

- (2) Delete the EDIT.HLP file by typing the following:

```
EDIT.HLP
```

- (3) To confirm that you deleted the files successfully, type the following and press ENTER key.

```
dir
```


The EDIT.COM and EDIT.HLP files will not appear in the list displayed on the screen.

FORMATTING A FLOPPY DISK

When you buy new floppy disks, you will need to format them before you can store data on them. You can format a disk as follows:

The data on the disk you format will be erased, so make sure you select a disk that does not contain data you may need later.

(1) Type the following at the command prompt and press ENTER key.

Format a:

Insert a disk in drive A when MS-DOS prompts you to do so. Ensure that the label is upside on the floppy disk, when you insert the floppy. If the floppy disk drive is $3\frac{1}{2}$ " type, then insert the floppy of that size only.

This command specifies that you want to format the disk in drive A. When you press ENTER, the following message appears:

```
Insert new diskette for drive A:
and press ENTER when ready
```

(2) Insert the disk you want to format in drive A label-side up. Then close the drive door. When you are ready, press ENTER. The following message appears:

```
Checking existing disk format
Saving UNFORMAT information
```

As it formats the disk, MS-DOS displays the percentage of the disk that has been formatted. When the format is complete, the following message appears.

```
volume label (11 characters, ENTER for none)?
```

- (3) A volume label is a name for your disk. You can give your disk any name you like, as long as it has 11 or fewer characters. For this exercise, type BPB and then press ENTER key. Information similar to the following appears:

```
1213952 bytes total disk space
1213952 bytes available on disk
    512 bytes in each allocation unit.
    2371 allocation units available on disk.
Volume serial Number is BPB
Format another (Y/N)?
```

- (4) If you have another disk to format, press Y. If not, press N.

HOW MS-DOS ORGANIZES INFORMATION ?

The preceding tutorial introduced the commands you will most often use to copy and move information. It also introduces some important terms-file, directory and drive-that you need to understand to use MS-DOS effectively.

Files

A file is the primary unit of storage on your computer. A file enables MS-DOS to distinguish one collection of information from another. For example, when you use word-processing programme to write a letter, you store the letter in its own file. Every file has a name, which generally indicates what type of information the file contains.

There will be hundreds or even thousands of files on your computer. This can make it difficult to locate specific files-just as it would be difficult to find a particular tool if you stored all the items in your workshop in one large box.

Directories

Storing groups of files in different directories makes files easier to find. For example, all the files that come with DOS 6 are stored in a single directory that is usually named DOS. If you ever need to locate DOS 6 file, you know where to look. Like files, directories can be created by you or by an application. For example, if you use your computer to store files that contain accounts, you might want to create a directory called salary, so these files will be easier to find.

The Current Directory

Directories would be hard to use if you did not know which one you were in.

How, you might ask, can you be "in" a directory? As long as your computer is on, you are in a directory and can easily find the files in that directory. DOS 6 indicates which directory you are in by displaying the directory's name in the command prompt. For example, the following command prompt indicates that you are in the DOS directory:

```
C:\DOS>
```

The following command prompt indicates that you are in the SALARY directory:

```
C:SALARY >
```

The directory you are in is called the current directory. Knowing which directory is current helps you find files and helps you move from one directory to another more easily.

You do not have to be in the directory that contains the files you want to use, but the commands you type will be shorter if you are. When you become comfortable with typing longer commands, you might rely less on being in the directory that contains the files you want to work with.

Sub-Directories

Directories can contain other directories. A directory within another directory is called a sub-directory. By creating subdirectories, you can better categorize your files. For example, suppose you have 75 recipe files in your RECEIPES directory. If you are looking for a particular file and cannot remember the name of it, you would have to search through the names of all 75 files. You can avoid this problem by creating subdirectories in the RECEIPES directory and storing the files in the appropriate subdirectory. For example, you could create subdirectories called BREADS, ENTREES, and DESSERTS, each of which might contain about 25 files.

The Root Directory

Strictly speaking, all directories, except for one, which is called the root directory. In this book, the term subdirectory is used only to emphasize the relationship between two directories. The root directory is the starting point from which all other directories branch out. The root directory does not have a name. Instead, it is represented by a backslash(\). When the root directory is the current directory, the command prompt appears similar to the following.


```
C:\ >
```

This prompt indicates you are in the root directory of drive C. Because the root directory is the basis for all other directories, you cannot delete it. Avoid unnecessary storing files in the root directory. There is limit to the number of files and directories the root directory can hold. Besides, it is a good idea to get into the habit of using sub directories to organize files.

Drives

Just as a directory is a group of files, a drive, which is always represented by a drive letter, is a group of directories. Drives are usually associated with a piece of hardware called a disk. A disk is a flat piece of metal or plastic on which data is stored. The most common types of disks are the hard disk, which is inside your computer, and the floppy disk and compact disc, which you insert into a slot either in or next to your computer.

Your first floppy disk drive is drive A. Your second floppy disk drive, if you have one, is drive B. Your hard disk, or at least part of it, is called drive C. The following command prompt indicates that drive C is the current drive and that the root directory, represented by a backslash(\), is the current directory.

```
C:\>
```

If the current drive is drive A and the current directory on that drive is SAMPLES, the command prompt would appear similar to the following:

```
A:\SAMPLES>
```

NAMING FILES AND DIRECTORIES:

Every file and directory, except for the root directory on each drive, must have a name. The following list summarize the rules for naming files and directories. File and directory names can be up to eight characters long. In addition, you can include an extension up to three characters long.

Using Extensions

Most filenames have two parts: the name and the extension. These parts are separated by a period. For example, LETTERS.TXT is a valid filename. The name (before the period) can be up to eight characters long and should reflect the contents of the file. The extension (after the period) can be up to three characters long and indicates what type of information the file contains. Extension can also be used in directory names, but are not commonly used for that purpose.

The following are examples of commonly used extension for filenames:

EXE, COM, or BAT

These extensions are used for files that contain programs. If you type the name of a file containing EXE, COM, or BAT extension at the command prompt, MS-DOS will run the programme that the file contains. The extension TXT is commonly used for unformatted text files. The extension SYS is commonly used for device drivers, which are files that enable your computer to communicate with hardware devices.

Many applications name files using an extension that identifies the application. It is generally best to use the extension that an application specifies, because the extension helps the application to identify the files that it created.

KNOW YOUR COMPUTER HARDWARE

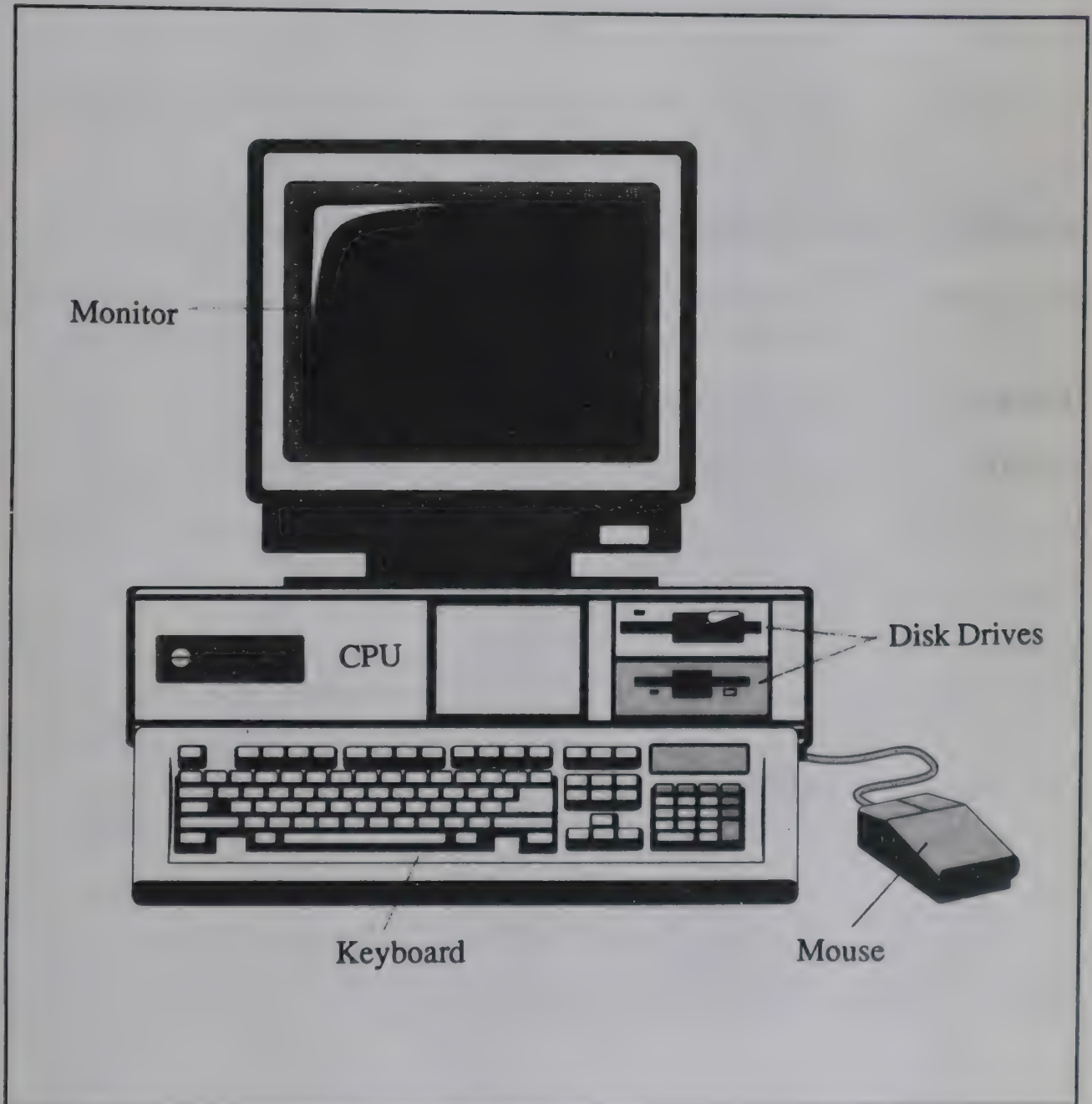
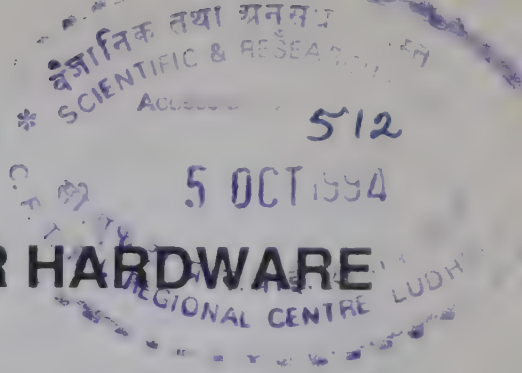


Fig. 1 Computer System

Table 1. Terms used in IBM PC System

Primary Name	Alternate Names	Translation
Monitor	Video display, CRT, VDT, video display terminal	The thing that looks like a TV
Keyboard	Manual input device, 101 enhanced	The part you type on
Computer box	System unit, tower case, desktop case	The main box that everything else plugs into
Mouse	Graphical input device, rodent, pointing device	Mouse
Trackball	Graphical input device, Trackman	UPside-down mouse
Floppy drive	5 1/4-inch, 3 1/2-inch, removable storage drive	The slot(s) in the computer box facing you where you insert floppy disks.
Hard drive	Hard disk, Winchester, mass storage device	C-drive
Memory	RAM, DRAM, extended, expanded	Where programs actually run
Floppy disk	1.44, HD, 1.2, 360, 720, 3 1/2-inch, 5 1/4-inch	What programs come on and where you back up to
Printer	Laser, dot-matrix, ink-jet, PostScript	Printer
Board	Card, PC board	Something you buy to increase the capabilities of your computer and that is installed inside the computer box
Motherboard	Motherboard	The main board inside the computer box that everything plugs into
CPU	Central Processing Unit, chip, 8088, 80286, 286, 80386, 80486, 486, Pentium,	The heart and brain of the computer
Processors (Intel 8086, 8088, 80286 80386 sx, 8038 Dx etc)		

INTRODUCTION

There are four things that determine how much basic horsepower your computer has. These are:

- (a) The type of microprocessor
- (b) The speed of the microprocessor.
- (c) The main memory of the computer.
- (d) The disk storage available.

The entire computer will sometimes be called in terms of the processor. For example, it may be described as a "386SX-20" or a "486-33." The first part refers to the processor itself and the second part to the speed of the processor. The processor, also known as the *CPU* (Central Processing Unit) is the brain of the system. The entire range of PC processors can be summed up in the following numbers: 8088/8086, 80286, 80386, 80486.

Generally speaking, the bigger the number, the more powerful the computer is and the more you'll have to pay for it. If you are buying a computer, don't buy anything less than an 80386-based computer. And if you're buying a new computer, go for a 486.

The 8088 and 8086 are always referred to by their full numbers. But everyone refers to the last three numbers for processors as the 286, 386, and 486 (two-eighty-six, three-eighty-six, and four-eighty-six).

MICROPROCESSOR SPEED

The second horsepower factor is CPU speed or system clock speed. The system clock is the basic timing signal that co-ordinates the movement of information between the CPU, memory, and other devices. The CPU clock speed, rated in megahertz (one million cycles per second; abbreviated MHz), is the popular number given by vendors. Faster system clocks generally mean faster operations—which means more work performed in the same amount of time.

CPU's with faster system clock speeds usually perform more work

The 8088/8086's top speed is generally 8 MHz, although some of these CPUs can border 10 MHz. The current top speed for the 286 is 20 MHz. The current Intel speed demon is the 386, which tops at 25 MHz to 40 MHz.

COMPUTER MEMORY

Another topic directly related to the performance of your computer is its memory. There are two types of additional memory that may be in your Pc, *expanded memory and extended memory*.

Memory is where things happen in your computer. The processor does the work, but it can only hold so much information inside itself.

How Much Memory Is Enough?

How much memory you need depends on what you need to do. Most programs will run better with lots of memory, and many programs require a substantial amount. The trend these days is towards programs that need large size of memory. This is because memory has become cheaper in recent years.

If a program says it requires 2 megabytes (2MB) of memory but 4 megabytes are "recommended," this means that it will sort-of run at 2 but needs 4 MB to be functional. (And it will be truly happy with 8.)

Types of Random Access Memory (RAM)

The first way RAM is talked about is in terms of RAM that you put into your computer on a chip. The RAM in your computer is on a physical device that may be called as follows:

- (a) **DIP (Dual Inline Package):**
A single RAM chip. DIPs are either plugged into the main board of the computer or are mounted on SIMMs or SIPP.
- (b) **SIMM (Single Inline Memory Module):**
A small circuit board with up to nine DIPs on it, plunges into a slot on the mother board.
- (c) **SIPP (Single Inline Pin Package):**
Similar to a SIMM but not interchangeable.
- (d) **DRAM (Dynamic Random Access Memory):**
The kind of memory contained on a DIP. Dynamic just means that when

you switch off the electric supply, the memory's gone.

(e) **SRAM (Static Random Access Memory):**

Another kind of memory found on a DIP, though more rarely. Static RAM is faster and lots more expensive than DRAM.

This RAM, in whatever physical form it takes, functions in your computer on conventional memory, extended memory, expanded memory.

How Memory Is Measured?

Memory is measured in bytes. A thousand bytes is a kilobyte (abbreviated K or KB), a million bytes is a megabyte (abbreviated M, MB or meg), and a billion bytes is called a gigabyte (abbreviated G, GB or gig).

Conventional Memory (RAM)

Conventional memory is the first 640KB of RAM in your computer. This is sometimes called DOS memory because DOS can run programs only in this part of memory. This is a limitation of DOS, because your microprocessor could use any memory and considerably larger quantities. To get the most out of conventional memory do the following:

- (a) Upgrade to DOS 6. This will allow you to reduce the amount of the memory that DOS uses for itself.
- (b) If you have a 386 SX or better processor use DOS 6's MEMMAKER program.
- (c) If you are still getting "out of memory" messages when loading DOS programs, consider getting a copy of QEMM and using its memory-optimizing program.

The first 640 K of RAM is known as 640 K memory or DOS memory or real memory or conventional memory.

Get More RAM Using DOS 6

DOS 6 comes with a program called MEMMAKER. If you have a computer with a 80386 or 80486 processor and extended memory, you can use MEMMAKER to free up some conventional memory by loading device drivers and memory-resident programs into high DOS memory.

To run MEMMAKER, go to the DOS prompt and type in

MEMMAKER

Follow the prompts. Choose Express Setup. Answer No to any questions you don't know the answer to. If you need help at any point, press the F1 key for help.

After you answer the questions, MEMMAKER tells you to press Enter to restart your computer. Co-operate and press Enter key. Then after some period of mysterious activity you'll be asked to press Enter key again. Go ahead.

When the computer has restarted (again), MEMMAKER displays a screen asking if your system appears to be working properly. If you haven't seen any error messages and everything seems to be OK, press Enter key. If something too strange for words has happened, press the Spacebar to select No and then Exit.

After you press Enter key, MEMMAKER displays a memory before-and-after screen. You should at least act impressed. Press Enter key again to quit MEMMAKER

Points to observe here are:

- (a) MEMMAKER will change your AUTOEXEC.BAT and CONFIG.SYS by adding new or editing existing commands.
- (b) Quit any programs that are running before starting MEMMAKER. Don't try to run it from inside Windows or while you're in the DOS Shell.

How Do You Know How Much Memory You Have ?

Type MEM at the DOS prompt, you'll see a summary of your computer's memory that will look like Figure 2.

C:\>MEM			
Memory Type	Total	= Used	+ Free
Conventional	640K	284K	436K
Upper	131K	65K	66K
Adapter RAM/ROM	253K	253K	0K
Extended (XMS)	3872K	1396K	1676K
Total memory	4896K	1918K	2178K
Total under 1 MB	771K	269K	502K
Largest executable program size		436K	(446120 bytes)
Largest free upper memory block		66K	(67216 bytes)
MS-DOS is resident in the high memory area.			
C:\>			

Fig. 2 Display of Memory

Expanded Memory

When software designers started figuring out that 640K of memory might not be enough, a group of them got together and came up with a standard way to get around this limit called *EMS* (Expanded Memory Specification). This kind of memory can be used by most DOS programs and PCs of all levels. On the 8088 or an 80286, you'll need to install a special memory board and driver to get this memory. If you have an older computer and are thinking getting such a board, save your money. You'll be better off getting a new computer, since most of the new programs will not run acceptably on your older machine, anyway.

Extended Memory

Extended memory is memory whose address is higher than DOS memory. It is not available on older 8088 or XT computers, and most older programs and some newer programs cannot use this memory.

You can use extended memory with 286 and 386 computers.

However, Windows loves this type of memory. Many other popular programs are starting to take advantage of it directly, such as Paradox, Lotus 1-2-3 (Release 3.0).

If you have an 80386SX or higher processor then even older programs can use this memory by converting it to expanded memory. You will need HIMEM.SYS and EMM386.EXE from DOS or a memory-managing program such as QEMM.

Expanded Versus Extended Memory

Very few programs use extended memory. If your programs require additional memory, you need a memory board that offers expanded memory. But for a few dollars more, you can buy a memory board that offers both expanded and extended memory. These combination boards are not only more versatile, but worth the extra expense. As later tips demonstrate, you may want to use both types of memory in your system.

More DOS programs use expanded memory than extended memory.

To expand memory on an 80286 system, choose a memory board that offers both expanded and extended memory.

The speed of expanded and extended memory depends on the system and software.

Several variables affect the speed of expanded and extended memory. First, various expanded memory boards shift gears somewhere between the 8 MHz to 12 MHz system clock range. When operating at lower clock speeds, the expanded memory boards transfer 16 bits at a time; at higher speeds, expanded memory boards transfer 8 bits at a time. This shift at higher speeds can make extended memory faster than expanded memory.

The efficiency of the EMS management software is a second variable. Some EMS software is not coded as efficiently as others. The more efficient code produces speedier operations; therefore, one EMS board may work faster than another.

The third and final variable is the applications software. The 286 has a LOADALL instruction that allows programs to access protected memory without actually switching the processor into protected mode. By using LOADALL instead of the INT 15 switch, programs can access extended memory faster than expanded memory.

If your software does not offer the option to run in both expanded and extended memory, the issue is moot. However, programs such as VDISK and RAMDRIVE offer both modes. If you have expanded and extended memory, you might test which is faster for your system. Run the software in expanded memory; then run the software in extended memory. You may be surprised at the difference.

The 386 CPU And Memory

All memory on a 386 computer is expanded memory. You need either of two hardware pieces for expanded memory: an expanded memory board or an 80386 CPU. The expanded memory board contains the circuitry for performing efficient use of expanded memory. The 80386 itself has the hardware for performing the efficient use of main memory.

The 386 CPU can treat extended memory as expanded memory

The 386 can shuffle physical memory into many different logical (apparent) orders. Although a program thinks it has 128K of contiguous memory, the program could actually be using 32 different 4K chunks of memory. The remapping is transparent to the applications program; the 386 processor handles it by using page mode and hides the process.

The result is that 386-based systems can treat extended memory as expanded memory without any additional hardware circuitry. The only software piece needed is a small control program that enables page mode on the 386.

This control program is usually provided by the system manufacturer. PC DOS V4 provides XMAEM.SYS for its 386-based systems. COMPAQ 386 systems use CEMM.SYS. An extended version of CEMM.SYS is sold with the Softbyte/386 and 386-to-the-Max packages, 386 versions of the softbyte emulator software. (CEMM, Softbytes/386 and 386-to-the-Max are written by the same author.) Another similar package is Quarterdeck's QEMM/386.

The difference between the 286 and 386 is evident when you expand the memory of your computer. Most 286 systems have a choice of memory expansions: expanded, extended, or combination expanded and extended. On 386 systems, you need only extended memory boards. The inherent power of the 386 plus the small control program turns extended memory into expanded memory. On 286 systems, converting extended memory as expanded memory lowers performance. The speed loss of using the control programs on a 386 is minuscule.

You can use the 640K through 1M region of real memory to run programs on a 386.

Another superiority of the 386 is its capability, through page mode, to use RAM in the high real-memory region of 640K through 1M. Because the 386 can make the physical memory appear to be addressed anywhere, programs can be loaded into a section of physical memory and logically appear to DOS and themselves that they run from real memory. The trickery is activated by the control program.

You can run multiple DOS programs on a 386

You can run any two or more DOS programs on a 386 without restrictions on program size, use of expanded or extended memory, or use of DOS interrupts. The 386-based computer has the horsepower to run several programs without serious performance degradation.

For hardware, you must have enough RAM. For software, you need a multitasking supervisor such as Microsoft Windows/386 or DESQview working with its QEMM/386 control program.

The 80386 has a hybrid operation mode, called virtual 86 mode, that crosses real mode, paging mode, and protected mode. This mode allows the 386 hardware to act like a series of 8086-based computers. The important magic used in virtual 86 mode is that each program thinks that it is running in the first 640K of memory.

The memory-paging hardware of the 386 hides the fact that the program may be anywhere in physical memory (above or below the 1M point) and that the program may be in several different chunks of physical memory. The same paging hardware also allows the program to use any extended memory as expanded memory.

Programs such as Windows/386 and the DESQview-QEMM/386 combination handle the loading of programs into different memory partitions and arbitrate conflicts when two or more programs try to grab the same DOS or system resource (such as the printer, modem, or disk drive). Although each supervisor has some restrictions on which programs may require some supervisor setup, almost any program runs without any change—even most programs that occasionally cause problems include communications programs (which need additional processor attention so that characters are not dropped).

The 386 has many advantage over its less powerful brethren. Speed and larger RAM sizes are the usual focus. The page-mapping hardware makes memory expansion a simpler choice (because all memory can be treated as expanded memory). However, the feature that is not fully used today, virtual 86 mode, may be the best reason to buy a 386-based system. No other processor does it better (it being the capability to run multiple DOS programs).

ADDING EXPANSION CARDS AND MEMORY

Table 2 lists the three major expansion buses for IBM Personal Computers and clones.

Table 2 IBM Expansion Buses

Bus	Expansion Slot Size	Compatible Computers
PC	8 bit	PC, XT, and XT clones
AT	8 and 16 bit	AT, PS/2 Model 30, and many 286 and 386 clones
MCA	16 bit	Models 30/286, 50, 50Z, 60, and clones
MCA	16 and 32 bit	Models 70, 80, and clones

Note that the MCA bus is different from the PC and AT buses. PC or AT bus boards will not fit in an MCA slot, nor will MCA boards fit in a PC or AT slot.

ADDING MEMORY

Memory is priced by its access time. Memory with slow access time is cheaper than memory with faster access time. Buying memory that is too slow causes hardware failures. The board either inserts too many wait states, or you suffer parity errors or bad memory errors. You can use chips faster than required, but you simply spend more money than necessary.

When you buy more memory chips for your system, make sure to buy the memory with the right access time

Check your expansion board for the correct speed. Most expansion boards require 150 ns or faster DRAMs. At 8 MHz, 120 to 150 ns DRAMs are required. At 10 to 12 MHz or faster, 80 ns SRAMs are required. Faster speeds require static column or static RAMs.

Have enough RAM in your system to satisfy your programs and your performance needs.

How much memory is right for you? The answer depends on you and your use of the computer. Demanding users or demanding usage require 1 to 3 megabytes or more of memory. Many users are comfortable with 1 megabyte. Others feel that 512K or 640K is more than adequate.

Remember that the absolute speed advantage is in using conventional memory. Programs and data work fastest from conventional memory, not from

expanded or extended memory—even in 386-based machines. But if conventional memory is insufficient, you need to use expanded or extended memory. The question then becomes, "For what will you use more than 1M of RAM?" Among the potential uses are increased program functions and system performance.

The best amount of memory is the smallest amount to do productive work and get the best performance from your system. If you can benefit from the advantages of more RAM, buy more. If in doubt, gain experience with your computer and then decide whether you need more RAM. Even at the lofty prices caused by the 1988 RAM chip shortage, RAM is still a bargain.

WHAT IS MATH COPROCESSORS ?

While computers are really good at doing lots of simple calculations very fast, they tend to have problems with complex calculations. The math coprocessor was developed to get around this problem. It is a special chip whose only task is to handle these complex calculations that the conventional microprocessor doesn't handle well.

Generally, if you are doing heavy-duty graphics work, or working with complicated spreadsheets, a math coprocessor can speed things up. Here are some simple rules:

- (a) If all you are doing is simple addition and subtraction, save your money, you will see no gain by adding co-processor.
- (b) The speed of the math coprocessor should be the same as the speed of the main processor. The math coprocessor should match the number of your main microprocessor, except have a 7 at the end instead of a 6. So, if you have an 80386 SX microprocessor, you get an 80387 SX math coprocessor; if you have an 80386 DX, you get an 80387 DX.
- (c) If you have an 80486 DX processor or higher, you already have a built in math coprocessor.

Parallel Ports for Connecting Printer

Parallel ports are generally used for printers, and they are frequently referred to as printer ports. The nice thing is that printer cables have connectors on each side that keep you from hooking them up wrong.

- (a) Most PCs have only a single parallel port, though you might have two.

- (b) If you have a choice between a serial port version of a printer or plotter and a parallel port version, take the parallel port version. Parallel ports are faster and don't require you to know anything about speed, stop bits etc.

With the advent of laptop computers, there are now all sorts of specialized devices that can be attached to parallel ports. While these were designed for portable computers, they work just fine on regular computers as well. They include network adapters, floppy drives, hard drives and SCSI adapters. This is another reason, that you should have a printer with parallel port only.

Modems

Modem is short form for *modulator/demodulator*. Actually, a modem is just a way to attach your computer to the outside world by way of your phone line. Modems let you send and receive information to and from other computer users.

Modems can be internal or external. If the modem is internal, you need to plug it into one of the slots on the main board of your computer. If the modem is external (that is, outside the computer box), it plugs into one of the serial ports on the back of the computer, plus it will need a separate outlet to plug into for electrical power. You should know the following:

- (a) Modems are rated by the speed at which they communicate. This speed is measured in bits per second (BPS), but this speed is frequently misstated as baud.
- (b) The most common modem speed choices are 1200, 2400, 9600, or 14400 BPS. Don't buy anything less than 2400 baud, because 1200 is painfully slow. If you intend to use the modem very much, spend the extra money for 9600 or 14400 BPS.
- (c) You can't use a modem without special software to control it. Many modems come with their own communications software, but you will probably want better software if you use the modem very much.
- (d) You can buy a combination fax modem for no more than the cost of the modem alone.

FAX Modem

Ten years ago, fax machines were very specialized equipment used by very few people. Now it seems like everyone has one. They are even becoming a common addition to the personal computer, in the form of a specialized kind of modem

called a fax modem. Like regular modems, they come in both internal and external versions, and can handle both fax chores and regular modem communications.

If you need a fax machine, especially for sending faxes, then you should seriously consider a fax modem. The advantage is that you can send the document directly from your word processor or spreadsheet program, without having to print it. The disadvantage is that you can only send stuff you created on the computer unless you also have a scanner.

Evaluate your needs carefully before deciding that a fax modem is a reasonable substitute for a fax machine. If you do get a fax modem, get one that operates at 14400 BPS so it can do both jobs efficiently.

Chapter 4

LOADING AND WORKING WITH DOS 6

INTRODUCTION

First, you need to install Dos 6 on your IBM PC system. After installing DOS 6, you will have to configure the operating system to make the most of the unique components of your system. For example, the amount and type of random-access memory (RAM) you are using. What are the internal and external peripheral devices like monitors, special keyboards, printers, modems, you are using? It is extremely important that you have a sound understanding of the current hardware and software components of your system before attempting to install DOS 6. At a minimum, you should make a complete backup of all data on your hard disk, or any data disk you will be using to store DOS 6 files.

INSTALLING DOS 6

DOS 6 includes an automated installation program that is suitable for most standard systems. Unless your system is non-standard in some way, you should be able to use this automated program to transfer DOS 6 to your system. To access the routine, put the DOS 6 setup disk in your system's floppy disk drive A, and enter the following command and press the enter key.

SETUP

The automated installation program will analyze your computer system and display a series of information screens and menus that inform you of the steps you need to take to complete the installation process. Read each screen and answer each prompt carefully.

You should take the following pre-installation steps if required:

- (a) Be certain that you have up to 4 MB of free disk space on your hard disk, if you are installing DOS 6 on it.
- (b) Prepare a blank diskette, labeled *Uninstall Disk*. You will use this disk during installation and you will need it later if you decide to restore your previous version of DOS.

- (c) If you are installing on floppy disks, prepare additional disks labeled as follows;
 - (i) Startup and Support
 - (ii) Help, QuickBASIC, Editor, and Utility
 - (iii) Supplemental
- (d) If you are currently running OS/2 in your system, you may be required to remove OS/2 first.
- (e) If you are currently running windows on your system, the installation procedure looks for Windows and makes certain changes to its configuration file. You will also be offered the option of installing DOS 6 backup, undelete and anti-virus utilities for windows or the DOS prompt or both.
- (f) In case you are currently using a disk-compression system on your hard disk, then you can install DOS 6 but you will not be able to use Uninstall disk. If you decide to remove DOS 6, you will be required to restore your data from the backup you made before you started.
- (g) Your hard disk is not partitioned in a standard format. In such a case, you must refer to documentation for special instructions. Some examples of manufacturers and operating systems that employ non-standard hard disk partitions are;
 - (i) Beronoulli
 - (ii) Everex
 - (iii) Novel
 - (iv) Ontrack Disk Manager
 - (v) Prism
 - (vi) SyQuest (removable hard disk)
 - (vii) UNIX
 - (viii) Vfeature Deluxe
 - (ix) XENIT

UNINSTALLING DOS 6

If after completing the installation process, you decide to restore your previous version of DOS, insert your Uninstall disk in your floppy disk -drive, reboot your computer by pressing the three keys **Ctrl-Alt-Del**, together and follow the instructions that appear on the screen.

The automated installation program saves the files from your previous version of DOS on a special disk directory named OLD-DOS.1.. The uninstall

program requires that the files on this directory exist in order to restore your previous DOS.

You cannot use the Uninstall disk, or restore your previous version of DOS after you have done any of the following

- (a) Deleted files on the OLD_DOS.1 directory.
- (b) Deleted or moved DOS's system files (IO.SYS and MSDOS.SYS)
- (c) Installed a disk compression program (including the Doublespace Utility, supplied with DOS 6)

CONFIGURING WITH MEMMAKER

The simplest way to optimize and configure DOS 6 for your system is to use memmaker utility supplied with the operating system. This application analyzes your system and rewrites the CONFIG.SYS file to make optimal use of your system's resources. Like the installation program it presents you with several screens of information and prompts you to make choices. On most standard systems you should accept the default response. Memmaker includes recovery procedure if you do not like the result or if any of your applications work incorrectly after you run Memmaker.

Carefully follow the instructions on the screen. These instructions differ from system to system. Memmaker stores the original version of CONFIG.SYS and AUTOEXEC.BAT in your DOS directory with the names, CONFIG.UMB and AUTOEXEC.UMB. The Memmaker command will also alter the file SYSTEM.INI if windows is presents on your system. A backup of the original SYSTEM.INI is saved as SYSTEM.UMB. If you must recover your old configuration manually, copy these file to your root directory as CONFIG.SYS and AUTOEXEC.BAT.

CONFIGURING WITH CONFIG.SYS AND AUTOEXEC.BAT FILES

CONFIG.SYS is an ASCII file that contains instructions to DOS for making best of your system's resources.

The AUTOEXEC.BAT file is an ASCII file that contains a series of DOS line commands which will be invoked, in sequence automatically at startup time. Although it can contain any command that can be validly invoked its purpose is to invoke additional configuration commands and start up programs that you would other wise invoke yourself each time you started your computer.

MULTIPLE CONFIGURATION

DOS 6 includes a special feature that allows you to write CONFIG.SYS so that you can choose among multiple configurations at startup time. For example consider RAM disk. A RAM disk is special area of random-access memory that appears to the operating system to be another disk drive. Its advantage is that it is *faster* than physical disk drive or more convenient for storing temporary files. RAM disks are initialized using CONFIG.SYS. There may be times when you want a RAM disk and other times when you would prefer not to use up valuable RAM that might be better used by one or more of your applications. Prior to DOS 6, you would be required to edit the CONFIG.SYS file and restart your computer to add or delete a RAM disk. In DOS 6, you can restart computer and choose whether or not to include the RAM disk. Before attempting to rewrite your CONFIG.SYS file to support multiple configurations, you must be familiar with standard CONFIG.SYS syntax and use driver files. Multiple configuration CONFIG.SYS file utilizes this fundamental syntax plus some additional elements; menu blocks, configuration blocks, directives, and common block.

The general structure of a multiple-configuration CONFIG.SYS file is all follows:

- (a) A sequence of required commands if any that must be invoked first, regardless of which option is to be selected.
- (b) An initial menu block, always named [menu], containing up to nine configuration choices for use.
- (c) Any number of configuration blocks, that contain commands referenced in optional configuration blocks.
- (d) The series of optional configuration blocks, containing the commands required for each optional selection from the menu.
- (e) A final common configuration block, always named [common] which is the last configuration block in the file. This block contains configuration commands that are always invoked, regardless of which option is chosen, but must follow the optional configuration blocks in the file.

In addition, a multiple-configuration CONFIG.SYS file may contain *submenus*. A submenu is another configuration block with a unique block name that contains additional menu commands. It is referenced like any other configuration block but functions like additional, nested menu. Use submenus if you require more than nine optional configuration or if you feel that submenus organize your possible choices more logically than a single menu.

The program listing shown below is a simple multiple configuration CONFIG.SYS file that demonstrates a typical structure. The elements in this file are explained more fully in the following paragraphs.

```
rem ** These commands are used by all options:
DEVICE=C:\SW\DOS\HIMEM.SYS
DOS=HIGH
rem ** This is the configuration menu:
[menu]
MENUCOLOR=15,1
MENUITEM=ramdisk1, RAMdisk (1024kb)
MENUDEFAULT=noramdisk,15
rem ** This is the configuration block for initialization
DEVICE=EMM386.EXE RAM HIGHSCAN
```

MENU BLOCKS

A *menu block* is a series of commands in CONFIG.SYS that describe a simple menu of options to be displayed on the screen. The series of commands is preceded by a *menu block name*, an identification enclosed in square brackets. For example, a multiple-configuration CONFIG.SYS file requires at least one menu block, identified by the menu block name *menu* on its own line, as follows:

```
[menu]
```

When DOS encounters this line in CONFIG.SYS syntax, it treats it as an instruction to display a startup menu on the screen. This menu block name is followed by a series of special commands that indicate what is to be included in the menu. The commands following the menu block name begin with the command keyword *MENUITEM*, as in the following example.

```
[menu]
MENUITEM = ramdisk1, RAMdisk (1024kb)
MENUITEM = ramdisk2, RAMdisk (2048kb)
MENUITEM = noramdisk, No RAM disk
```

Notice that the MENUITEM key word is followed by an equal sign (=) and to additional parameters, separated by a comma. The first parameter is a *configuration block name* which will be explained shortly. The second parameter is optional

text to be displayed on the screen, a prompt that tells the user the type of configuration that will be accessed if this menu item is selected. This menu block will then cause DOS to display the following menu when you start your computer.

```
MS-DOS 6 Startup menu
1. RAM disk (1024kb)
2. RAM disk (2048kb)
3. No RAM disk
Enter a choice:
```

You can select one of the options by entering the menu number, or by moving a highlighted bar to the desired option and pressing Enter key.

Enhancing The Menu Block

You can use two CONFIG.SYS commands to enhance your menu block. The first, `MENUCOLOR`, allows you to instruct DOS to display the menu using specified text and background colors (if your system is equipped with the colour monitor).

The second command, `MENUDEFAULT`, instructs DOS to make one of the menu items the default selection and select it automatically after a specified number of seconds (in the range from 0 to 90 seconds).

Adding these commands to our example menu yields the following revised menu block.

```
[menu]
MENUCOLOR = 15,1
MENUITEM = Ramdisk1, RAM disk(1024kb)
MENUITEM = Ramdisk2, RAM disk(2048kb)
MENUITEM = Noramdisk, No RAM disk
MENUDEFAULT = Noramdisk, 15
```

The last line in this menu block specifies *noramdisk* as the default configuration block to be automatically selected if the user does not make a selection after approximately 15 seconds.

Configuration Blocks

A configuration block is a series of CONFIG.SYS commands that are preceded by a *Configuration block name*. Like a menu block name a configuration block name

is a keyword enclosed in brackets. The keyword may be any character series you like but for clarity you should make it brief and descriptive. In the previous menu block three configuration block names were referenced; *Ramdisk1* (for the first RAM disk); *ramdisk2* (for the second ram disk); and *noramdisk* (for no ramdisk). The CONFIG.SYS file must contain these configuration block names followed by their associated CONFIG.SYS commands. Remember that all CONFIG.SYS commands following a configuration block name are considered part of the referenced configuration block, until another configuration block menu is encountered in the file. Following examples, although cumbersome, would be valid configuration blocks using example names, initializing extended memory, loading DOS in the high memory area, and optionally initializing the RAM disks.

```
[ramdisk1]
DEVICE = C:\DOS\HIMEM.SYS
DEVICE = C:\DOS\EMM386.EXE RAM HIGHSCAN
DEVICE = C:\DOS\RAMDRIVE.SYS 1024 512 512/E
[ramdisk2]
DEVICE = C:\DOS\HIMEM.SYS.
DEVICE = C:\DOS\EMM386.EXE RAM HIGHSCAN
DEVICEHIGH = C:\DOS\RAMDRIVE.SYS 2048 512 512/E
[noramdisk]
DEVICE = C:\DOS\HIMEM.SYS.
```

Include Directives

Notice that, because the RAM disk drivers in the above example are located into upper memory using the DEVICEHIGH command, it was necessary to initialize HIMEM.SYS and EMM386.EXE before the RAM disk can be initialized. In the above example, however this two-line sequence was repeated in each configuration block which is cumbersome. There is a better way. To make CONFIG.SYS file more efficient and avoid copying duplicate syntax lines throughout, DOS 6 allows you to gather these common commands into their own configuration blocks and reference these blocks instead of copying the lines. Using the INCLUDE command, you could rewrite the previous example as follows:

```
[expanded]
DEVICE = EMM386.EXE RAM HIGHSCAN
[ramdisk1]
INCLUDE = expanded
DEVICEHIGH = C:\DOS\RAMDRIVE.SYS 1024 512 512/E
[ramdisk2]
```



```
INCLUDE = expanded  
DEVICEHIGH = C:\DOS\RAMDRIVE.SYS 2048 512 512/E  
[noramdisk]
```

THE COMMON BLOCK

If common commands must follow the optional commands in the CONFIG.SYS file you can place in their own configuration block in the end of the file named [common]. DOS 6 recognizes this block as a group of CONFIG.SYS commands that are invoked always but must be invoked after one of the optional blocks is invoked. Even if your CONFIG.SYS file has no common commands in the end, it is a good practice to end the CONFIG.SYS file with the [common] block name in case any subsequent application you install attempts to add its own configurations lines to the CONFIG.SYS file.

CONFIGURATION OPTIONS IN AUTOEXEC.BAT

It is entirely possible that options selected from a CONFIG.SYS menu will effect commands invoked in the AUTOEXEC.BAT file. DOS 6 provides a simple mechanism for allowing AUTOEXEC.BAT to make choices between various commands, based on the user's configuration selection. When a multiple configuration CONFIG.SYS file is used, DOS 6 stores the block name of the selected configuration block in a special environment variable named CONFIG. For example, if the user selected [noramdisk] in the above example CONFIG, would be automatically set to equal *normaldisk*. Based on the value of the CONFIG variable, AUTOEXEC. BAT can include lines to use or not to use the RAM disk.

ENTERING COMMANDS

Enter DOS 6 commands at the DOS system prompt (A>), which is usually a letter on the screen that corresponds to the currently active disk drive. DOS 6 commands are invoked by entering the command name; for example, copy, dir or rename.

External Commands

DOS 6 has two types of commands: external and internal. External commands are

actually small separate utility programs that accompany the operating system and expand its usefulness. If you are using DOS 6 on a floppy-disk system, you will need to insert the DOS 6 diskette containing these programs into your computer's floppy drive before you invoke them.

If you are using DOS 6 system with a hard disk, all the external program files you intend to use into a separate subdirectory, such as C:\DOS, and to include this subdirectory name as part of the PATH statement in your AUTOEXEC.BAT. For example, you can type the following command on DOS prompt.

```
A:XCOPY A: B:
```

Will run the external XCOPY command if the XCOPY command file is on drive A.

```
C:\DOS\XCOPY A: B:
```

Will run the same command if the XCOPY command file is in the \DOS subdirectory of drive C.

If the DOS directory is part of the system's PATH statement, or if you are currently logged into the subdirectory where the XCOPY command file resides, you may give the drive address and command path.

Internal Commands

DOS 6 internal commands are always available to the operator, and may be entered from any DOS prompt. For example:

```
DIR\P
```

is internal command that will execute at any time.

Command Help

ALL DOS 6 commands accept a special question mark option (\?) on the command line. When a command name is followed by this option, DOS 6 does not execute the command, but instead displays a description of the particular command's syntax and usage. For example:

```
COPY\?
```

returns the following:

Copies one or more files to another location.

```
COPY [/A|/B] source [/A|/B][+ source /A|/B][+...]
[destination [/A|/B]][/V]
```

source Specifies the file or files to be copied.

/A Indicates an ASCII text file.

/B Indicates a binary file.

destination specifies the directory and/or filename for the new file(s).

/V Verifies that new files are written correctly.

FUNCTION KEYS

DOS 6 provides a handy set of special function keys that assist you when entering repetitive commands or correcting typing mistakes. These keys affect whatever command is currently stored in the command line buffer, a portion of RAM used to save and recall the most recently entered command. Only one command at a time is stored in this buffer, unless you are using a special utility like DOSKEY. The following list describes these special function keys;

F1 or →
(right arrow
key)

Enters the character from the command line buffer on the active command line. DOS 6 remembers its current position within the buffer; if you press F1 again, the next character will appear on the active command line. It is possible to enter the entire contents of the buffer, one character at a time, by repeatedly pressing this key.

F2, then x

Enters all the characters from the buffer starting at the current buffer position up to (but not including) the first occurrence of x, which is any single character you specify. This is useful for re-entering commands in which a single character must be overwritten or added. If the specified character cannot be found in the buffer, this key has no effect.

F3

Enters all the remaining characters in the command buffer, starting from the current cursor

F4, then <i>x</i>	position. This key is useful when repeating whole command with little or no modification. Skips over all the characters in the command line buffer up to the specified character <i>x</i>, then enters that character on the command line when you press F1 or →. If you press F3 after entering the character, the remaining portion of the command line buffer is displayed. If the specified character does not appear in the command buffer this key has no effect.
F5	Replaces the command line buffer with the contents of the active command line. It is also useful for correcting typing errors at the beginning of the command line. For example, imagine you have entered the following incorrect command; CCOPY A: B: To correct the typo quickly, press F5 type an <i>x</i> and press F3 to finish the command. The F5 function key also has a special meaning when DOS 6 first loads it in to memory.
Insert key	Switches to Insert mode, whereupon characters you type from the keyboards will be added to the command line buffer at the cursor position rather than overwriting the character at the position. Press F1, →, or F3 to display the remaining portion of the command line buffer.
Del key	Deletes the character in the current buffer position. The key must be pressed for each character you intend to delete.
Esc key	Cancels changes you have made to the command line buffer and restores it's original contents. This key must be pressed before you press the enter key.
Backspace or ← (left arrow key)	Moves cursor to the left one position on the active command line and erases its character at that position. If the erased character was changed from the character in the buffer, the

original character in the buffer is restored. If you are already at the beginning of the command line, this key has no effect.

Certain key combinations are called *control keys* because their functions become active when you hold down the Ctrl key and type a character. Control keys perform a number of useful services.

Ctrl-C	Stops a DOS 6 command in processing and returns to the DOS 6 prompt.
Ctrl-H	Functions the same as Backspace.
Ctrl-P	Causes the console output to be sent to the printer as well as the screen. The printer must be <i>on line</i> . To stop printing, give ^P again (^ stands for Control key).
Ctrl-S	Pauses the execution of the DOS 6 command. Useful when large amount of data flow beyond the boundaries of the screen. If your key board has a pause key, this key will do the same thing. To resume processing, press any key (except Ctrl-C or a function key).
Shift-Prt-Sc	sends the current contents of the screen to the printer.

FILE NAMES

Files are the heart of a DOS 6 system. Related information such as a letter, book, chapter, spreadsheet, database, or application program is stored under a unique file name. A file name is 1 to 8 characters long and may include a file extension at the end, which is a period followed by 3 more characters.

Legal characters in file names include all letters of the alphabet (upper-and lower case are treated the same), numeric digits, and punctuation marks, except for the following;

* ? = + | [] ; / < > , ' .

Wildcard Characters

DOS 6 Supports two wildcard characters, ?(question mark) and *(asterisk), that will allow you to specify whole groups of line names. The ? (question mark) stands for any single character in the specified position within the file name or

extension and the * (star) stands for any set of characters continuing to the end of the file name or extension. For example following syntax displays the names of all files on the default drive.

```
DIR *.*
```

REDIRECTING OUTPUT

Many DOS commands display messages of some sort. Normally these messages appear on your monitor screen. However it is possible to direct the output of DOS 6 commands to another device or to a disk file by means of a redirection symbol followed by a target.

The redirection symbol for output is the closing brace (}), or greater than sign(>)

Standard target device names are as follows:

CON	The console, or screen display.
PRN	The default printing device
LPT1	Parallel printer port #1
LPT2	Parallel printer port #2
COM1	Communication port # 1
COM 2	Communications port # 2
COM3	Communications port #3
COM 4	communications port #4

An Auxillary Output Device.

In addition to those standard devices, you may redirect output to a file name. If the file that you name does not exist it is created. If it exists it will be over written. If you want to add to an existing file instead of overwriting it, double the redirection symbol;

```
>>
```

For example:

```
DIR.>PRN
```


Lists a directory of the current drive and sends the output to the standing printing device.

```
- DIR >DIRFILE.TEX
```

sends the output to a file named DIRFILE.TEX.

```
DIR >> DIREFILE.TEX.
```

adds the output from the DIR command to the contents of the file DIRFILE.TEX.

REDIRECTING INPUT

Many DOS 6 commands accept input of one sort or another. Normally the user enters this input with the keyboard. If the keystrokes that make up this input are capable of being stored in a disk file DOS 6 can read the file and accept its contents just as if the keystroke had been typed. This is useful in reducing the margin of error in repetitive tasks. Command input may also be accepted from any device that is capable of supplying data to DOS 6 such as COM1 to COM4 or AUX.

The redirection symbol for inputs is the opening brace (`{`), or less-than sign (`<`). For example, the MORE command will accept input from a file on disk. The MORE command displays characters on the screen but if the number of lines is greater than the available screen display, the MORE command pauses and waits for the user to press a key before continuing the display. This prevents characters from scrolling off the screen before the operator has a chance to read them.

```
MORE < LONGFILE.TEX.
```

displays the contents of LONGFILE.TEX. Pausing each time the screen fills.

PIPING

Many DOS 6 commands produce output that can be re-processed by other DOS 6 commands. One way to do this is to redirect the output to a disk file, and then send the contents of the file as input to the next DOS 6 commands. However, DOS 6 allows a more convenient means of accomplishing this, by permitting you to combine multiple commands on a single command line. This technique is

called *piping*.

The piping technique works as follows: The output of one DOS command is sent to another DOS 6 command, which in turn processes the output it received and then either sends it to another DOS command or displays the final output. Here are some examples:

```
CHKDSK C:/V | MORE
```

This command sends the output from the CHKDSK C:/V command to the MORE command, which pauses the display of the list each time the screen fills.

```
CHKDSK C:/V | FIND "COMMAND.COM"
```

sends the output from the CHKDSK C:/V command to the FIND command, which extracts and displays all occurrences of the file named COMMAND.COM. If you try this command yourself be sure that you specify the file name entirely in uppercase characters.

```
DIR C: | SORT | MORE
```

sends the output of the DIR command to the SORT command, which sorts the file list in alphabetical order, then sends the output to the MORE command, which pauses the display each time the screen fills with file name.

BACKING UP YOUR DATA

Computer storage systems hold vast amount of data that can be wiped out by a technical error or careless command entry. If you have current backups of your data, this is usually no more than a temporary *annoyance*. If you do not have backups however, it can be an ugly *disaster*.

Here's an important tip regarding backups: make them before you experience a problem, not after. If you suddenly discover a problem with your data, there is usually no good purpose your current backups disk with another backup; you might replace good data on your backup disk with bad data. If you want to make a copy of your data after you have discovered a problem, do so on a *separate set of floppy disks*.

You should always have at least *one* current backup of your data, *two* backups are preferable. They should be kept in a secure location away from your computer. This will give you the necessary sense of security to experiment with the DOS 6 commands described in this book.

Chapter 5

DOS 6 SHELL AND COMMAND PROMPT

One of the first thing the computer does when turned on is to check its main memory (RAM). Some computers display the amount of memory that has been checked as a rapidly changing number on the upper-left corner of the video screen. On the other hand, your computer may only show a blinking line on the screen. After it has checked the memory, the computer copies DOS 6 from the disk into memory and gives control to it. DOS 6 then checks the keyboard for your commands, starts the programs you request, and writes the output to the video screen and printer. Thus DOS 6 becomes a resident part of your computer. DOS 6 always gives control to the running program and all your dialogue is with the running program. When the program is finished, the memory space is released and DOS 6 takes control once again.

WORKING AT THE COMMAND PROMPT AND THE DOS 6 SHELL

DOS 6 manages your computer's resources. The part of DOS 6 that controls the hardware such as the video screen, key board, mouse, disks, and printer is the *kernel*. A second part of DOS 6 that interprets your commands and causes the kernel to do what you want is called the *command interpreter*. In DOS 4, 5, and 6 you can enter commands using the *Shell* which is DOS 6's menu and window system. As you can see in Figure 5.1, the DOS 6 Shell is actually an interface between you and the command interpreter that provides an easy way to enter commands.

The Command Prompt versus the Dos Shell

Each time DOS 6 is started, either the command prompt or the DOS 6 Shell is automatically displayed on your screen. If your computer begins with the command prompt, you can change it to start with the DOS 6 Shell automatically instead. The DOS Shell is easier to use than the command prompt.

THE DOS SHELL

The DOS 6 shell allows you to perform a wide variety of file management

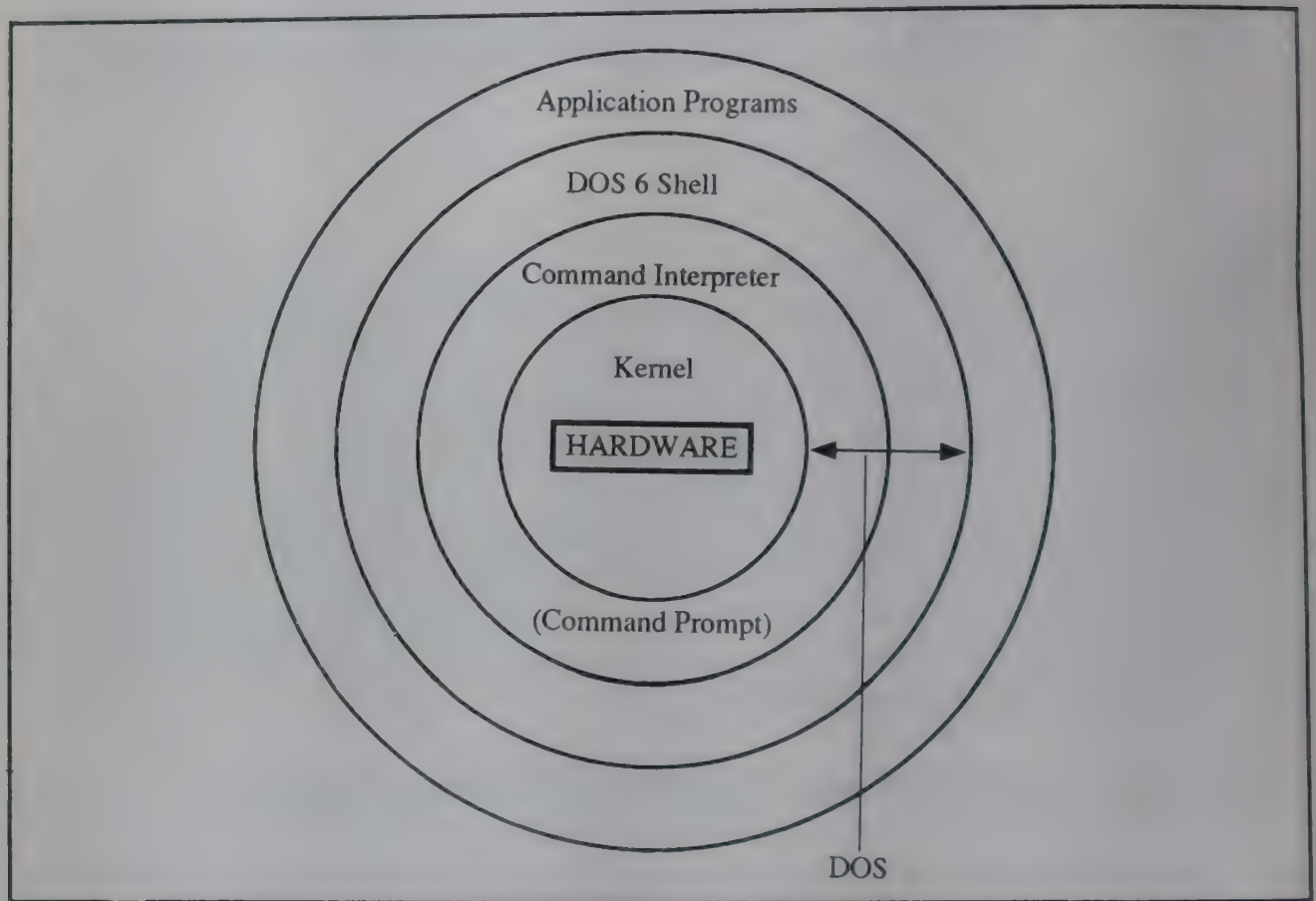


Fig. 5.1 DOS 6 manages the interaction between your hardware and your application programs

tasks in a more intuitive way. For example, you can:

- (a) Maintain an ongoing display of your hard disk's directory structure plus lists of files within each directory.
- (b) Launch an application program by pointing to a data file you have associated with it.
- (c) Move, copy and delete data files in a graphic, menu driven context.

The DOS 6 Shell holds more than one open application program in RAM at a time and switches between them.

The Shell Display

Load the DOS 6 shell by typing `DOS SHELL` at the DOS prompt. If you plan to use the DOS 6 shell frequently you may include the command as the last line in your `AUTOEXEC.BAT` file. After you invoke the command you will see a display similar to the one pictured in Figure 5.3.

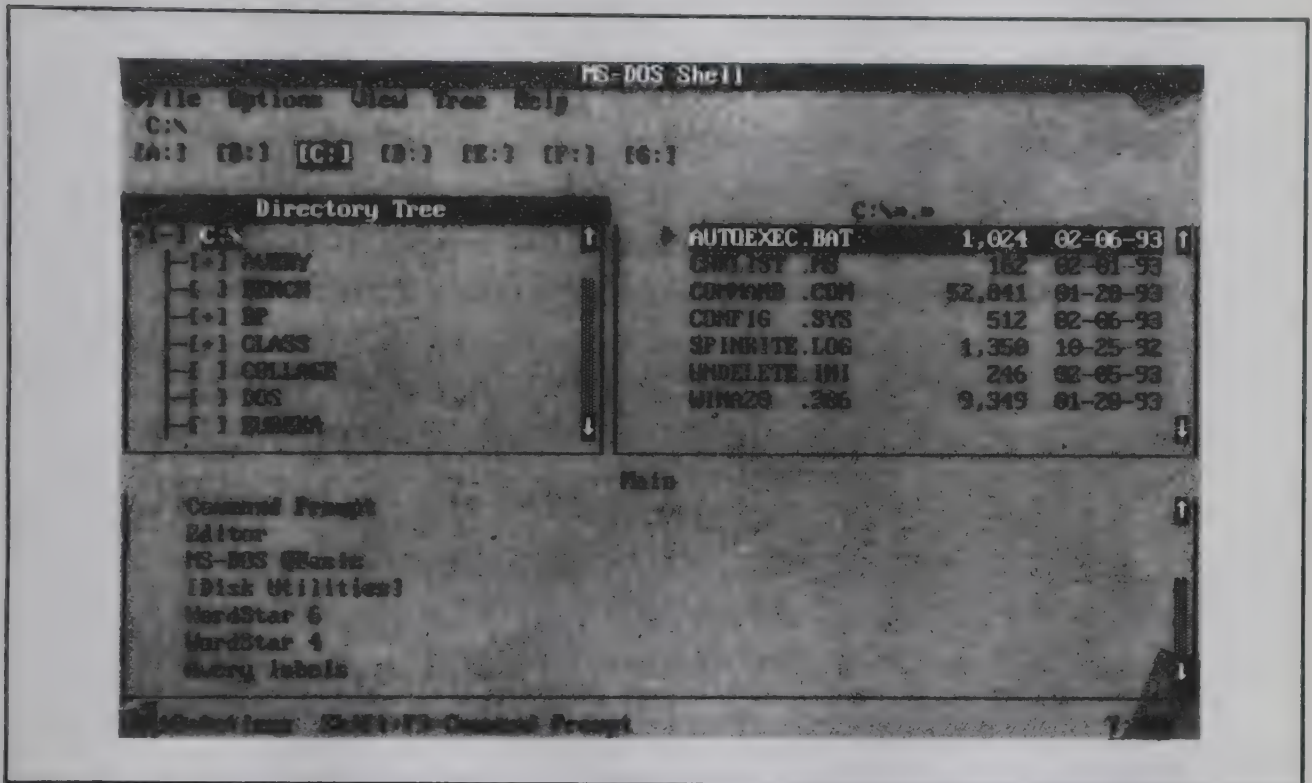


Fig. 5.2 DOS6's screen

Following are the main features of the shell.

The Pointer

The *pointer* is a small icon that moves about the screen. You control its movements by means of a mouse. Although all the features of the DOS 6 shell are accessible by means of the keyboard a mouse is recommended for higher efficiency.

You can use either the mouse or the keyboard to move the pointer between the various window's, select menu commands or file names start applications, or change drives and directories. If you are not using a mouse you may use the **Tab** Key to highlight different windows in sequential order and the keyboard's arrow keys to move the pointer between highlighted items in a selected window. You may select an item by pressing the **spacebar** or **enter** key.

Highlighting and Selecting Items

An item is *highlighted* when it appears in a different or reverse colour. To highlight items, touch them with the pointer and press the pick button. If you are using the keyboard, move the highlight bar using the keyboard's arrow keys.

To *pick or select* an item, touch it with the pointer and press the pick button once. To accomplish the same thing using the keyboard move the highlight bar with the arrow keys and press the spacebar.

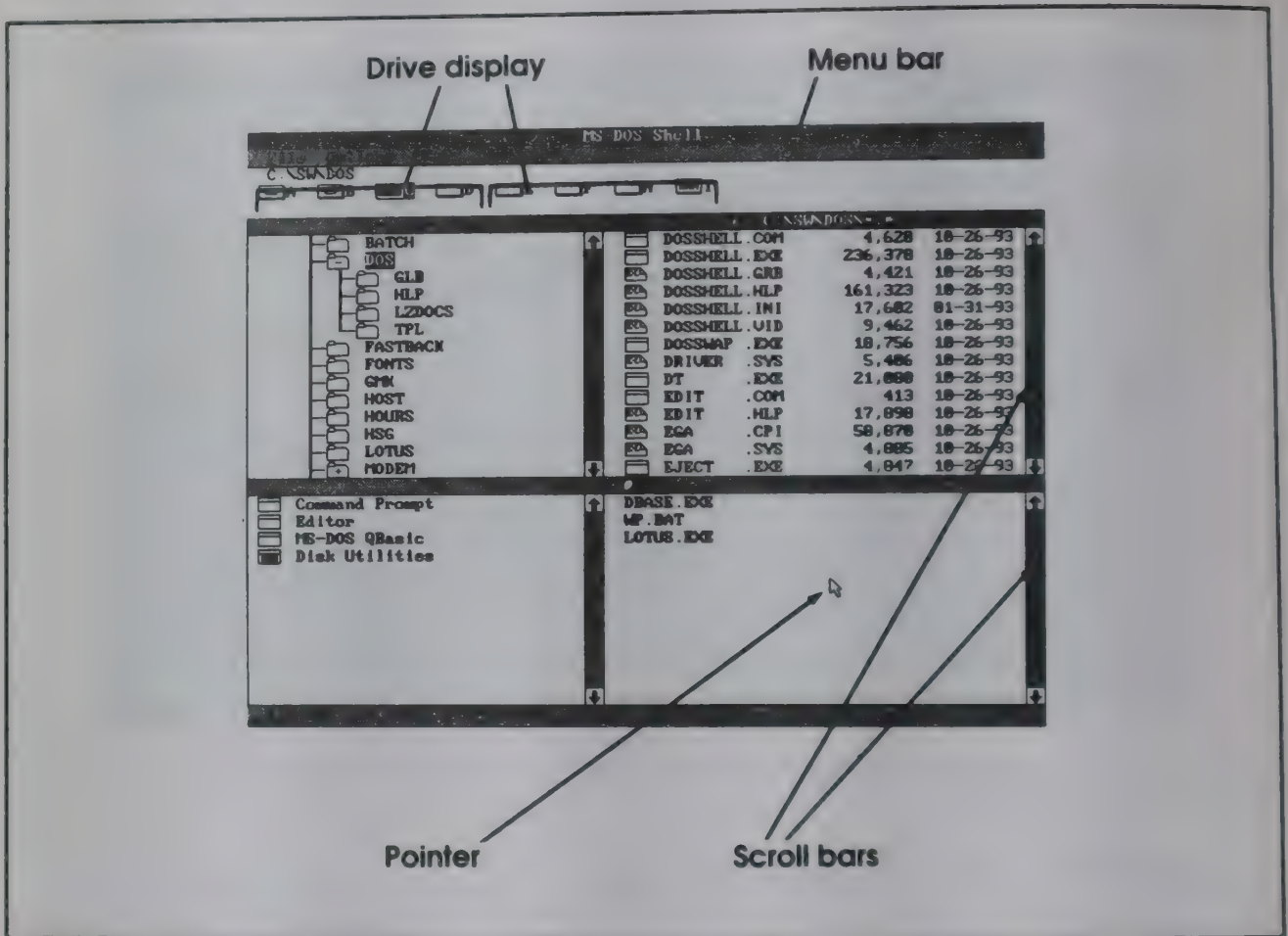


Fig. 5.3 The DOS shell

To *double-click* on an item, move the pointer to it and quickly press the pick button twice. To accomplish the same thing using the keyboard move the highlight bar with the arrow keys and press Enter.

In certain circumstances, you may need to move the mouse while holding the pick button down. For example you use this technique to start applications with default files. To do this first pick the default file. Then while holding the pick button move the pointer to the application file name (a file with the extension. COM, EXE, or BAT) if the application can be successfully launched with the selected data file. The pointer icon will be replaced by the data file's icon. If the application cannot be successfully launched, the pointer arrow is replaced by a small circle with a diagonal line through the center.

The Menu Bar

The *menu bar* is the first active line on the DOS shell screen. It contains keywords that activate pull-down menus of various operating system commands.

To activate a menu, highlight the associated keyword then press the pick button. If you are using the keyboard activate the pull-down menus by holding down the **Alt** key and pressing the first letter of the menu item. For example, to activate the File pull-down menu, press Alt-F. Alternatively you can access the menu bar by pressing the F10 function key and moving between the keywords with the arrow keys.

Dialog Boxes

When you invoke certain commands in the DOS shell, a *dialog box* will appear. An example of a dialog box appears in Fig. 5.4. Dialog boxes contain prompts for different parameters associated with the shell command. For example, a dialog box may contain one or more *label search followed by a data field*. You can move between data fields by selecting them or using the keyboard arrow keys or Tab key. Type the appropriate command parameters in the data fields as indicated by the label.

To edit existing text in a data field, press the **Backspace** key or simply begin typing it in (which will blank the data field if the text is highlighted). Press the **Insert** key to toggle between inserting characters and overwriting them.

Certain dialog box options are represented by a *toggle switch*, in cases where a command option may be either active or inactive. A toggle switch appears in a dialog box as a label preceded by a pair of brackets([]). When you select the brackets, an X either appears or disappears indicating that the option is either active or inactive. DOS 6 saves the current state of all toggle switches and presents them as the default the next time the dialog box appears.

If you are to choose one option from among several possibilities, the dialog box will display a *multiple choice list*. This list appears as a column of labels with a small circle to the left of each. Choose one option by selecting the circle. The selected circle fills, indicating that the option is chosen. You may pick only one option from the list; picking one automatically clears whatever is currently chosen. Most dialogue boxes contain other command switches called *buttons*. Standard dialog box buttons are as follows.

OK	Accepts the chosen dialog box parameters and either executes the command or causes another dialog box to appear.
BACK	Backs up, one at a time, through a series of nested dialog boxes.

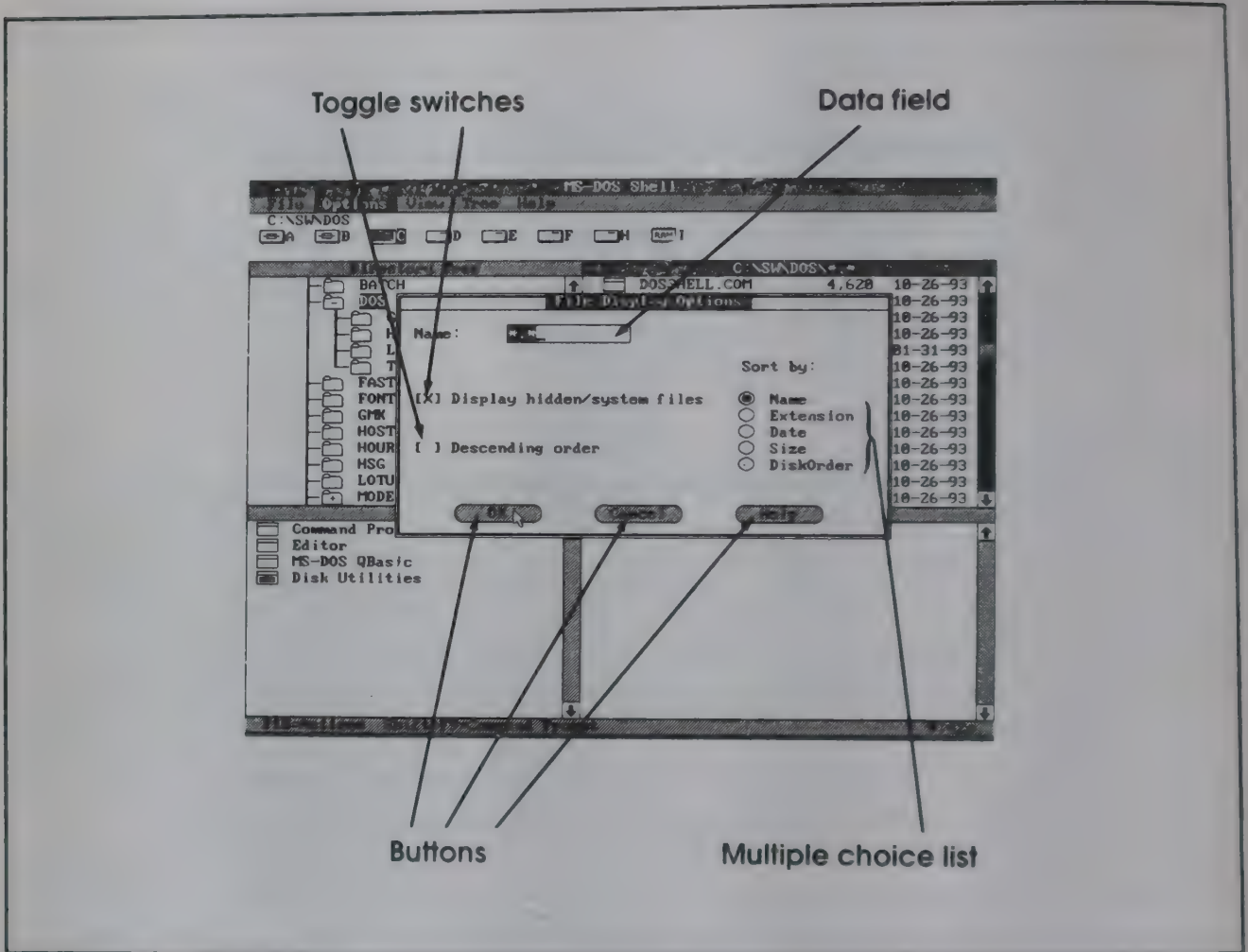


Fig. 5.4 A dialog box

CLOSE	Closes the current window and returns to the shell without taking any other action
CANCEL	Cancels the command and returns to the shell.
HELP	Temporarily suspends the command and displays a window of information regarding the current command.
ADVANCED	Displays a second dialog box of additional parameters that are used in special circumstances.

Scroll Bars

When a dialog box or window contains text or a data list that is too large to fit, a *scroll bar* will appear to the right of the display. Scroll bars are illustrated in

Fig. 5.3. Just to the right of the Directory Tree window and the file Display window. A scroll bar is a vertical bar with an arrow at the top and bottom and small rectangle inside. You can use the scroll bar to scroll the display within a window or dialog box by one of several means:

- (a) *Pick an Arrow with the pointer.*
Selecting the top arrow will scroll the display up, the bottom arrow will scroll it down. If you select the arrow and hold the pick button down, the display will scroll continuously.
- (b) *Move the Small Rectangle in the Scroll Bar*
Select the rectangle with the pointer and hold the pick button down. As you move the pointer up and down you move the rectangle within the scroll bar. And the display within the dialog box will scroll up and down, following the movements of the rectangle.
- (c) *Press the PgUp or PgDn Key:*
To scroll the display one screen-full at a time.
- (d) *Press the Up or Down Arrow key:*
To scroll the display one line at a time.

The Drive Display

The *drive display* appears just under the menu bar. It shows which drives are available in the system. In the DOS shell's graphic display the drives are represented by a drive letter followed by an *icon*, a small picture that indicates the type of drive associated with each letter. If the drive is a floppy-disk drive, the drive icon includes a drive bay door. If the drive is a hard-disk drive, the icon does not include the door catch. If the drive is a RAM disk, the icon appears as a small memory chip.

To make a drive active move the pointer to the desired drive letter and press the pickbutton. If you are using the keyboard move the pointer using the keyboard's arrow key and press the **spacebar**.

The Directory Tree

The *directory tree window* displays the directory structure of the currently active drive. To log on to a particular directory move the pointer to it and select it.

Each directory is accompanied by an icon that looks like a little file folder or square brackets, depending on your display. If there are sub directories nested below a given directory the icon will contain a small plus symbol (+). You may display these nested sub directories by picking the icon. If you are using the keyboard, highlight the directory and press the **plus** key.

If the nested sub directories are currently displayed the icon of the parent directory contains a minus sign (-). To close the directory, pick the icon containing the minus sign. If you are using the keyboard highlight the directory and press the **minus** key.

The File Display

The files in the currently active directory are displayed in the *file display window*. A small icon appears to the left of each file name. If the file is an executable program, the icon appears as a small rectangle with a horizontal line near the top. If the file is a data file the icon appears as a sheet of paper with the top right corner folded over.

You may launch an application program by double-clicking on it or if using the keyboard, by highlighting it and pressing **Enter** key.

Data files may be selected singly or in groups for any file-management operation such as copying moving deleting, and so forth.

If you want to select a group of files, select the first file, then move the pointer to the next desired file. Hold down the **Ctrl** key on the keyboard and select the next file. Continue to select files while holding down the **Ctrl** key, until all desired files are highlighted. This method requires a mouse.

If you are using the key board only, you may select a series of files by holding down both the **Shift** key and the **spacebar** and moving the pointer with the up or down arrow key.

If you want to include all the files in a directory, choose **Select All** from the **File** pull-down menu or if using the keyboard, hold down the **Ctrl** key and press the **forward-slash(/)** key.

If you want to deselect the chosen files, select another file. If you want to deselect files without selecting another file, choose **Deselect all** from the **File** menu or, if using the keyboard, hold down the **Ctrl** key and press the **backslash (\)** key.

When you have selected the desired data files, pick the appropriate DOS file-management command from one of the pull-down menus.

The Program Window

The *program window* lists available application software commands, called *program items* or the names of other group of programme items called *program groups* nesting in their own window below the current one. In the shell's graphics display program items appear with a small rectangular icon to the left of the name. Program groups have a similar icon that contains a small window symbol.

The standard version of the DOS shell includes three program items, the

command prompt, the DOS text editor, and the microsoft quickBASIC programming environment plus one program group which is called Disk Utilities. This group contains a short list of program items that handle fundamental file management tasks: backing up files, restoring files from backup formatting and copying disks, and undeleting files.

To add a new program group or item, highlight the program window and pick the New command from the file menu. When you select this command, a dialog box appears offering you a choice between a program group or program item. If you pick a program group, it will be nested below the current program window. If you pick a program item, it will appear in the currently active program window.

After you select one or the other and select the OK button, additional dialog boxes will appear, depending of your selection.

The Active Task List Window

The *active task list window* is displayed if you have enabled the *Task Swapper*, a DOS shell feature that allows you to have several applications open at the same time. Each open application is listed in this window, and you may move from application to other application by picking the application file name from the window.

HELP WITH SHELL COMMANDS

The DOS shell provides *context-sensitive* help. You can access this help at any time while in the shell by pressing F1 key. If you press F1 while a menu command is highlighted, you will receive detailed information on that command.

You can access Help for various topics using the pull down menu options discussed in this section. To reveal the Help menu, pick the help keyword from the menu bar. Unlike other menus the Help menu is fully available no matter which window in the shell is active.

When you access the Help feature, a *help dialog box* appears on the screen. You can scroll through the information in this dialog box using the scroll bar, or you can double-click on any related topic to reveal another dialog box of information. Related topics are easily indentified, as they are displayed in a highlighted or otherwise contrasting colour. You can continue to display as many help windows as you need in order to receive the information you are looking for.

A simpler alternative to using the Help Index would be to activate the Options pull-down menu, move to the Enable Task Swapper command using the keyboard arrow keys, and when the command is highlighted, press F1.

File Menu Commands

File Menu Commands are the commands that appear when you pick the File keyword in the menu bar. These commands help manage files on disk and control the behavior of files within the DOS shell. For more details on individual commands, highlight the command in the menu and press the F1 function key. Some commands are available only when certain shell windows are active. Some commands behave differently depending on which window is active.

OPTIONS MENU COMMANDS

Option Menu Commands are the commands that appear when you select the Options keyword in the menu bar. These commands configure certain fundamental aspects of the shell's screen display and control how files are displayed and selected in the File Display window. For more details on individual commands, highlight the command in the menu and press the F1 function key.

VIEW MENU COMMANDS

View Menu Commands are the commands that appear when you select the View keyword in the menu bar. These commands help to manage the configuration of the shell's various windows. For more details on individual commands, highlight the command in the menu and press the F1 function key.

TREE MENU COMMANDS

Tree Menu Commands are the commands that appear when you select the Tree keyword in the menu bar. These commands change the display of the Directory Tree, and are available only when the Directory Tree or File Display window is active. For more details on individual commands, highlight the command in the menu and press the F1 function key.

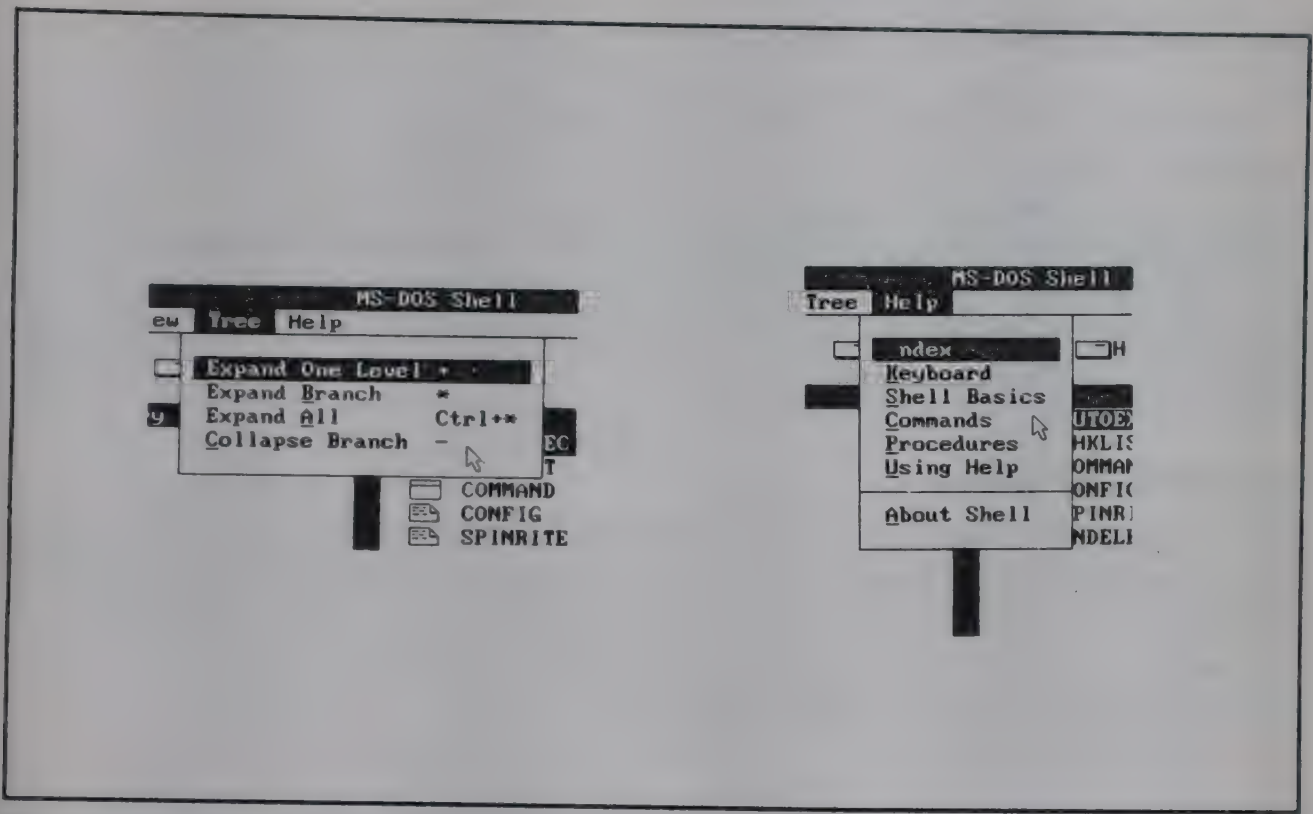


Fig. 5.5 Tree Menu & Help Menu

SWITCHING TO THE COMMAND PROMPT FROM THE DOS SHELL

In order to change from the DOS Shell to the command prompt press the F3 key. Let's explore the use of the command prompt.

Using Command Prompt

The disk drives are named with letters of the alphabet; A and B are floppy-disk drives and C is the hard disk. The drive you are currently working on is called the current or *default* drive, and the letter shown at the beginning of the line indicates which drive is the default. For example C:\> indicates that it is C drive. On your screen you will also see a blinking symbol following the > symbol. It is called the *cursor* and it shows where the next character you type will appear on the video screen. You can change from one disk drive to another by typing the new drive name followed by a colon. Thus to change to drive A, make sure there is a disk in drive A and give the command

A:

Then press the **Enter** key. To return to drive C, type C: and then press the **Enter** key.

Whenever the computer displays the system prompt, C >, you can type a command. After you type the command at the keyboard, you must tell the computer that the command is complete and ready to be processed or *executed* by pressing **Enter** key. The **Enter** key tells DOS 6 to process your command and to move the cursor to the beginning of the next line at the command prompt or to the next screen in the DOS 6 shell. Remember, DOS 6 will not act on your command until you press the **Enter** key.

Using DOS Commands

Whether you are working at the command prompt or the DOS Shell, DOS remains resident in the computers memory. Many commands are built into DOS so that they are always ready in memory. These are known as *built-in* or *internal* commands.

For example, if you give the command

cls

and the screen will be wiped clean. (cls stands for clear screen.) Next give the command

vol

and you will see something like:

```
Volume in drive C is OFFICE R3  
Volume Serial Number is 1234-5678
```

Now give the command

dir

and you will see a listing of files on your video screen of subdirectories and the programs stored on the current directory.

Changing Date & Time

Your computer has a clock so it can put the time and date on each disk file you create or change. Most computers have a built in clock battery so the clock will continue to run after you shut off your computer.

To check your computer's date, type

date

and press **Enter** key. The response will be something like this

```
Current date is Mon 08-12-1993
Enter new date (mm-dd-yy):
```

If the date is correct, just press **Enter** key. However, if you want to change the date, type the month, day, and year separated by hyphens. You don't have to type a leading zero for months and days less than 10. Furthermore, during the 20th Century, you only have to give the last two digits. That is, you can give either 1993 or 93. As an alternative, you can give the Date command with the new date on the same line. That is, you can type

```
date 9-13-93
```

To check your computer's time, type

```
time
```

and press **Enter** key. The response will be something like this

```
Current time is 3:16:37:77p
Enter new time:
```

HOW TO TURN OFF YOUR COMPUTER

When you want to turn off the computer, check the drive activity lights (the red light in the floppy drive) to make sure that DOS 6 is not using one of the disks. Otherwise, you can damage the disk and lose information stored on it. When the activity lights are off, you can safely shut off the computer with the same switch you used to turn it on. You can leave floppy disks in the drives, or take them out and put them away. If you have disk, be sure to remove the floppy disk from drive A before starting the next time.

Chapter 6

DOS 6 COMMANDS IN DAILY USE

Important commands and their proper functioning is given in the following paragraphs. You will find that these commands are used most of the time. Hence, it is advisable to remember these commands and their proper use. For detailed use see the appendix 'A'

CD

Displays or changes the current logged subdirectory, parameters. You can use this command to change Directories.

SYNTAX

CD [drive:] [path]

Drive specifies the drive you want CD to operate on. Path specifies where you want to change to.

CHKDSK

The specified directory contains common errors. It checks out disk and give a report. Most common errors displayed are lost clusters, cross-linking, and allocation errors.

SYNTAX

CHKDSK [/F] [drive:]

If you don't specify a drive, CHKDSK will report on the current drive. The /F switch tells CHKDSK to repair file errors it finds. If you invoke

CHKDSK followed by another drive letter, CHKDSK will analyse that drive.

CLS

Clears the screen just typed in. It will erase all characters on the screen and display DOS prompt-like A >. This is useful for clearing error messages

COPY

Copies and combine files one or more files from one location to another.

SYNTAX

Copy from where to where. The drive, path, and file names are part of from where and to where.

Copy A:*. * B:

DEFRAG

A command which reorganizes the files on hard disk and speeds up the disk.

SYNTAX

DEFRAG [drive:]

at the DOS prompt and follow the instructions. DEFRAG optimizes disk performance by arranging fragmented files in contiguous sectors and thus makes file reading faster and saves wear and tear on a hard disk.

DEL OR ERASE

Deletes the files

SYNTAX

DEL [drive:] [path] filename

The drive and path only have to be included if the file is not in the same directory as you are.

DIR

Displays a list of files and directories in the directory you specify.

SYNTAX

DIR [drive :] [path] [/P] [/W] [/B]

Drive and path only have to be included if you want a listing in a directory other than your current one. The switches are

/P Displays a Page-at-a-time

/W Displays five columns Wide

/B Displays just the Bare names

DISKCOPY

Copies the contents of one floppy disk to another floppy of the same size and type, including the volume name, subdirectories and any hidden files.

SYNTAX

DISKCOPY source : target : / switches

To make a copy of your disk in drive A, just type in

DISKCOPY A: A:

You'll be prompted to put in the source disk (the original) and the target disk (the copy). Add the /V switch if you want DOS to Verify that the copy is identical to the original. This slows the process a lot but is comforting when you want to be absolutely sure that the copy is good.

FASTHELP

In DOS 6, just type

FASTHELP

at the prompt to get a one-line summary of each DOS command. To get the same in DOS 5, type

HELP

at the prompt

FORMAT

All floppies must be formatted before they can be used by DOS. This command prepares a blank disk for storing data.

SYNTAX

FORMAT drive: [/F: size] [/S]

You only need to use the /F switch if you are formatting a low-density disk in a high-density drive. If the disk is a 5 1/4-inch low-density disk, the switch will be /F:360. If it's a 3 1/2-inch low-density disk, the switch is /F:720.

The /S switch copies the system files to the floppy and makes it bootable.

Switchs

- /1. Formates a double sided disk as a single sided disk.
 - /4. Formates a double sided disk in a high density disk drive (1.2 m Bytes) drive
 - /V. Prompts you to add a volume label to the disk after formatting.
-

MD

Creates a new subdirectory.

SYNTAX

MD [drive:] path

It requires that you provide a subdirectory name on the command line.

MOVE

Moves one or more files to the location you specify. This command is in DOS 6 only.

SYNTAX

MOVE from where to where

If you want to move RAM.TXT to the LETTERS directory on drive C, the command is

MOVE RAM.TXT C: \ LETTERS

If you want to rename the file at the same time, it's

MOVE RAM.TXT C:\ LETTERS SHYAM.TXT

You can even rename the directory from LETTERS to MEMOS by typing in

MOVE C: \ LETTER C: MEMOS

MSAV

It scans memory and hard disks for the presence of computer viruses.

SYNTAX

At the DOS prompt, type in

MSAV drive:\path /switchs

Select Detect to scan your drive for viruses; selct Detect and clean to scan for viruses and remove any that are found.

Switches

- /S. Scane files on the specified drives and directories but do not remove virus.
 - /C Scans files on the specified drives and directories and remove virus.
 - /P Runs MS AV in graphies mode.
 - /N Turns off display while scanning.
-

REN

REName changes the file names.

SYNTAX

REN filename1 filename2

Include the path to filename1 if the file is not in your current directory. You can not use REN, to rename subdirectories, or to move files. Use the MOVE command, explained above, to do that.

REN RAM.TXT SHYAM.LTR

This command changes the name RAM.TXT to SHYAM.LTR

RESTORE

Restores files from disks made using the BACKUP command from earlier version of DOS.

SYNTAX

Restore source drive : target drive

Example

RESTORE A: C:

Restores those files from the back up disk in drive A that originally existed on the current logged sub-directory.

SYS

Copies DOS system files to a new disk. Also useful when the booting from the hard disk fails.

SYNTAX

SYS source : \ path target:

Sys transfers the DOS system files (IO.system, MS DOS.system) plus (command.com) files to a Disk.

Example

Sys A: C:

Copies system files from disk in drive A to drive C and makes the system bootable from hard disk drive C.

UNDELETE

Restores files deleted using the DEL command (DOS 5 and DOS 6 only).

SYNTAX

UNDELETE filename

or

UNDELETE /LIST

The /LIST switch gives a listing of all the files that DOS is to recover.

UPGRADING YOUR COMPUTER TO DOS 6

INTRODUCTION

In this chapter you will learn how easy it is to install DOS version 6 on your computer! If your computer has an earlier DOS version (such as 3.3, 4, or 5), you can upgrade to DOS 6 and take full advantage of the capabilities of DOS 6.

PROCEDURE

To install DOS 6 on your computer, you run the Install program stored on the first DOS 6 disk. This program will guide you through the steps needed to install DOS 6 on your computer's hard disk. To start the installation program, follow these steps:

- (a) If you are at the DOS Shell, press F3 to return to the DOS prompt.
- (b) Get a new floppy disk or one that does not have anything on it that you want to keep.
- (c) If it is a new disk, put it in drive A and format it.
- (d) Using a felt pen, write the name Recovery on the label of the disk.
- (e) Remove the recovery disk from drive A.
- (f) Put the first DOS 6 installation disk in drive A.
- (g) Make drive A current by typing the command
 a:
and pressing Enter key.
- (h) Type the command
 install
and press Enter key to start the installation program.
- (i) Follow the directions given on the screen. A horizontal bar appears, showing the percentage of the installation that has been completed.
- (j) When instructed to do so, remove the first DOS disk and insert your blank recovery disk (not your crash-recovery disk) in drive A.

- (k) Change back to the first DOS disk if instructed to do so. The installation program will tell you when to change to the other DOS disks.

The next screen asks about installing three programs: Backup (MSBackup), Undelete, and Anti-Virus (MSAV). For each of these programs, you can install the DOS 6 version, the Windows version, both, or neither. The setup program has made the initial choice for you. The necessary disk space for each is shown on the right side of the screen. Also, the total disk space required by the new DOS and the remaining disk space are given. The Windows version of the three programs needs about 650K bytes more than the DOS version.

- (l) Check the selections. Change them if they are not what you want. Of course, if you do not have Windows, you will not select that version. Move the cursor with the down or up arrow key, then press Enter key to select one of the four options.
- (m) From the information currently in your Config.sys and Autoexec.bat files, the installation program selects the name of your DOS directory. Then it asks for your approval.
- (n) At the end of the installation program, remove the floppy disk from drive A and press Enter key. The computer will restart with DOS 6.

Chapter 8

HARD DISK INSTALLATION AND PARTITIONING

INTRODUCTION

When you partition a hard disk of sizes 120 M Byte and above, you can have different operating systems working for the same IBM PC A/T system. For example, you can have DOS 6 to manage one part of a disk and UNIX operating system to manage another. Each of these sections of the hard disk is called a *partition*. You can form one to four partitions on a hard disk.

DOS 6 can create partitions upto 2 gigabytes
--

TYPES OF PARTITIONS

Two types of partitions can be set up for DOS 6:

- (a) Primary
- (b) Extended

Primary Partition

The primary DOS partition is the partition that contains DOS and is the first partition on the disk. Typically, this first partition on a disk is devoted completely to a DOS system.

Secondary Partition

The extended DOS partition is a separate partition of your hard disk that cannot be used for booting, but can be divided into separate logical disk drives.

An extended partition helps you to access data on a large physical drive more easily. When you create an extended DOS partition, it is assigned the next logical drive letter. For example, if you have a 100 Mb hard-disk drive, you can create a 65 Mb primary partition and a 35Mb extended partition. If DOS assigns drive C to the primary partition, the extended partition, will be called drive D.

You could also subdivide the extended partition into more logical drives (up to the letter Z), such as E or F and so on. Usually hard disk are of 120 MByte capacity .

HOW TO CREATE PARTITION

You must create partitions before using a hard-disk drive. The easiest route is to simply use the FDISK program that is supplied to you along with DOS 6 floppies. To use multiple operating systems from the same disk, however, you need to leave room for additional partitions and then create those partitions with the other operating system. Each of these partitions will be a primary partition, but you must designate one as the active partition, which will gain control when your system boots up.

FDISK assigns drive letters to the primary partitions of all physical drives before assigning letters to any logical drives.

Should you install a second hard-disk drive on your system and use FDISK to partition it, its primary partition will become drive D, and all drive identifiers of any logical drives in the first disk's extended partition will be jumped up by one letter. For example, if your first disk has a primary drive C and an extended partition for drive D, then adding a second hard disk will change the former drive D into drive E. The primary partition on the new hard drive become your system's drive D.

You must always be careful not to loose any existing data on your hard disk during this required partitioning process. If your disk is already being used and you wish to make a new partition, you should first back up all your data and only then run FDISK from a system disk. Finally, you'll need to reformat your disk before restoring your files to it.

SETTING HARD DISK

The FDISK command can be easily invoked from the shell or from command prompt. After this command creates the appropriate partitions, you must then logically format each of the logical hard disks. Any existing data on them will be destroyed when you create partitions with FDISK.

Any existing data on your disk will be destroyed when you create partitions with FDISK. So take backup before doing partition.

When you first invoke FDISK, the screen will clear and the FDISK options screen shown in Figure 8.1 will appear. As you can see, there are five choices in this initial FDISK screen. The fifth choice only appears if your system has more than one hard-disk drive. The number that appears in the *Current fixed disk drive* line (in the upper portion of the screen) will reflect which hard drive, is currently the subject of your other partitioning commands.

You can work on only one hard-disk drive at a time, but you can switch from the drive you are working on to another drive. If your system has only one disk drive, then choice 5 will not appear and the current drive number will remain as 1 during all subsequent FDISK operations.

```

MS-DOS Version 6
Fixed Disk Setup Program
(C)Copyright Microsoft Corp. 1983 - 1993

FDISK Options

Current fixed disk drive: 1

Choose one of the following:

1. Create DOS partition or Logical DOS Drive
2. Set active partition
3. Delete partition or Logical DOS Drive
4. Display partition information
5. Change current fixed disk drive

Enter choice: [1]

Press Esc to exit FDISK

```

Fig. 8.1 The FDISK Options menu

Creating primary Partition

You must select the first option on the FDISK Options menu to create a DOS partition, or to create a logical DOS drive in a secondary, or extended partition. Since you are presently using DOS, and not another operating system like UNIX, you can only create DOS partitions. To put another operating system such as UNIX onto the hard disk, you have to use that system's FDISK, which would create its partitions next to DOS's.

If you plan to use hard disk to later support another operating system, do not partition the whole disk. Leave some room so that you can later load another operating system such as UNIX on it.

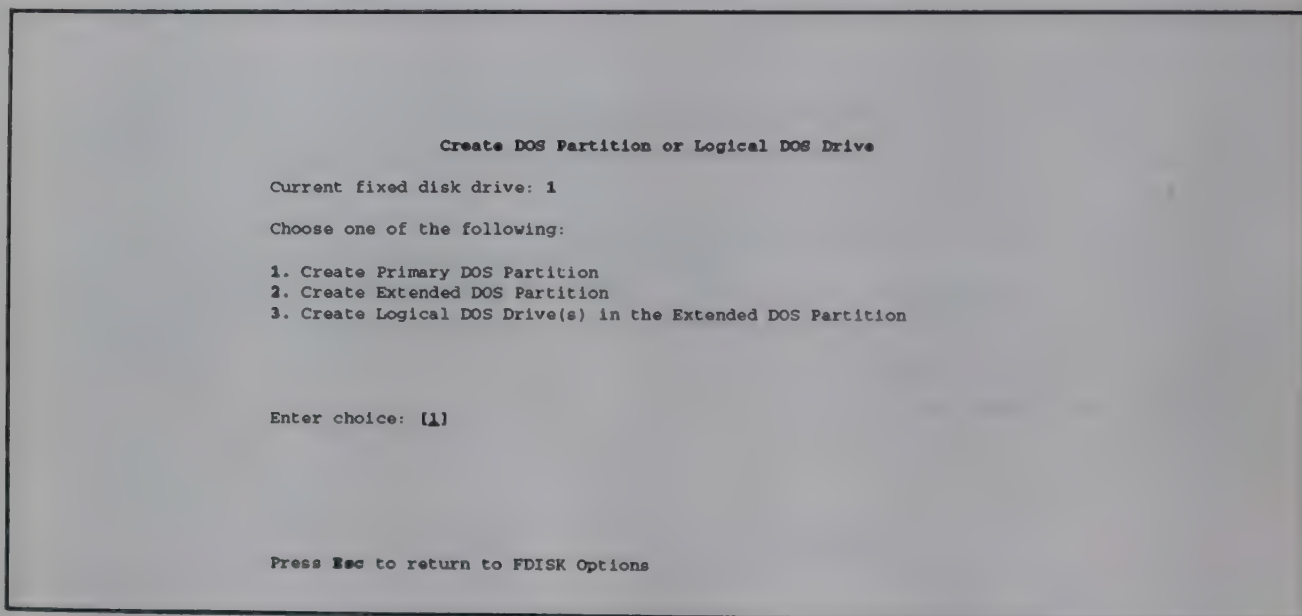


Fig. 8.2 Creating DOS partition

Assuming you are starting from scratch, select choice 1 to create the primary DOS partition. You will then see the screen shown in Figure 8.3. Answering *y* at this screen tells DOS to use the whole disk. If your system has only a single hard drive, and you use the entire disk for a single partition, FDISK automatically makes it the active partition. This means that the system is immediately ready to reboot, using this single hard-disk partition. FDISK will prompt you with the following message:

```

System will now restart
Insert DOS system diskette in drive A:
Press any key when ready
  
```

Since you just created the partition, there is nothing on the hard disk. Consequently, the system must be rebooted from a previously prepared system diskette, or from your first Setup diskette that is part of your DOS system diskettes. You can format the entire hard disk as a system disk, just as you might do to a

```

                Create DOS Partition or Logical DOS Drive

Current fixed disk drive: 1

Choose one of the following:

1. Create Primary DOS Partition
2. Create Extended DOS Partition
3. Create Logical DOS Drive(s) in the Extended DOS Partition

Enter choice: [1]

Press Esc to return to FDISK Options
    
```

Fig. 8.3 Creating DOS partition

```

                Create Primary DOS Partition

Current fixed disk drive: 2

Total disk space is 100 Mbytes (1 Mbyte = 1048576 bytes)
Maximum space available for partition is 100 Mbytes (100%)

Enter partition size in Mbytes or percent of disk space (x) to
create a Primary DOS Partition.....: [ 65]

No partitions defined

Press Esc to return to FDISK Options
    
```

Fig. 8.4 Creating Primary DOS partition

floppy disk.

If you are creating a primary DOS partition on a second hard drive, you will simply receive the following message:

```

Primary DOS Partition created,
drive letters changed or added
    
```

You can press Esc to return to the main FDISK Options screen. If you answer N in Figure 8.3, another screen will appear (see Figure 8.4). From this screen, you can create one or more smaller partitions from the total hard-disk space. Message near the bottom of the screen:

No Partitions defined

shows that DOS has not yet created disk partitions. Pressing Enter now will create the primary DOS partition and produce the resulting status screen shown in Figure 8.5.

The screen of this figure tells you that the partition you just created on drive C is a primary DOS partition (PRI DOS) which consists of 65 Mb, or 65% of the entire physical disk. Pressing Esc key at this point returns you to the FDISK Options menu.

There can only be one primary DOS partition on any hard drive. When DOS boots up, the system files from the first hard drive's primary DOS partition are loaded into memory for operations.

```

                                Create Extended DOS Partition

Current fixed disk drive: 2

Partition  Status  Type  Volume Label  Mbytes  System  Usage
D: 1      PRI DOS              65      UNKNOWN    65%

Total disk space is 100 Mbytes (1 Mbyte = 1048576 bytes)
Maximum space available for partition is 35 Mbytes (35%)

Enter partition size in Mbytes or percent of disk space (x) to
create an Extended DOS Partition.....: [ 35]

Press Esc to return to FDISK Options

```

Fig. 8.5 Creating Primary partition

Setting the Active Partition

The active partition is the default partition on your system's first hard disk. It is

used to boot the system. After creating primary DOS partition on the first hard drive, FDISK warns you that you must specify at least one partition to be the controlling one when you switch on the system.

```
WARNING :- No partition are set active -
disk 1 is not startable unless a partition is set active
```

Choosing option 2 on the FDISK Options menu presents a screen that lists all specified partitions on the first hard drive. If you choose option 2 when dealing with a hard disk other than your system's first one, you'll receive a message telling you that partitions on drive 1 can be made active.

Typically, at this Set Active partition screen, you would type the number 1 so that the primary DOS partition will have control when your system comes up. However, if your partitioned disk to include other operating systems, you can use the Set Active Partition choice to specify that another operating system gain control when your system next boots up. Entering a partition number and pressing Enter key will result in a message that the selected partition has been made active.

Creating an Extended DOS Partition

In the example in this chapter, you have used 65Mb out of a possible 100Mb. If this were the first hard drive, you could install a non-DOS operating system in the remaining space, or you could create an extended DOS partition and define logical DOS drives in that space. To create an extended DOS partition, which you can do on any hard drive you are partitioning, you select choice 1 on the FDISK Options menu and then select choice 2 on the Create DOS Partition or Logical DOS Drive menu (see Figure 8.2 above).

The screen shown in Figure 8.5 then appears, telling you the current partitioning status. In Figure 8.5, the maximum available space that remains for use in this partition is 35MB (35% of the available physical disk). DOS initially displays the maximum available space in megabytes as the default entry in square brackets for this extended DOS partition size.

You only need to type a new value over the 35% to override the default. Alternately, you can enter smaller number. DOS will interpret your entry as magabytes if you simply enter a number, or as a percentage of the total physical disk space if you enter a number and a percent sign (%). DOS then displays your current disk partition information, which includes sizing for both your primary and extended partitions (see Figure 8.6). You can see that the 35 megabytes taken up by this extended DOS partition represents 35% of the total hard-disk space. Pressing Esc key at this screen will return you to the initial FDISK options menu.

You can then create logical drives in this extended partition.

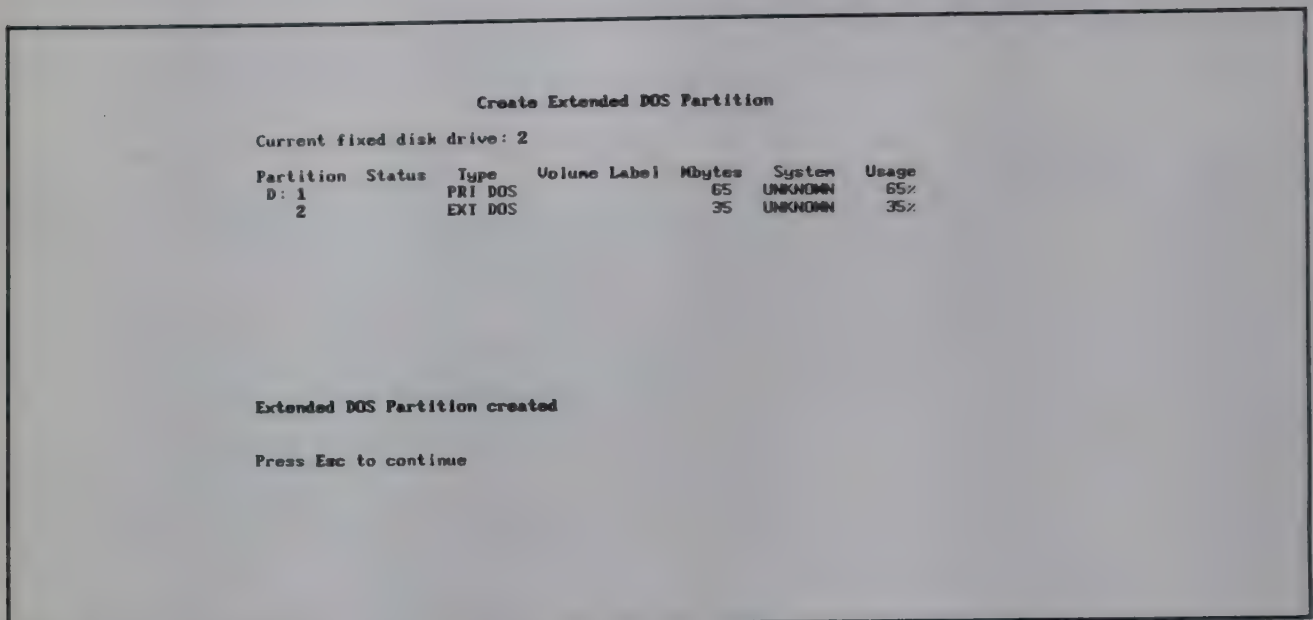


Fig. 8.6 Creating Extended DOS Partition

Creating Logical Drives in an Extended Partition

To further define the drive structure of your disk, you should:

- First select choice 1 on the FDISK Options menu and create DOS partition or Logical DOS Drive.
- Then select choice 3 on the Create DOS Partition or Logical DOS Drive menu.
- Create Logical DOS Drive(s) in the Extended DOS Partition.

DOS tells you that no logical drives have yet been defined in this extended partition (see Figure 8.7). You are also told how much space is currently available for logical drives. This maximum amount is 35Mb in Figure 8.7, all of which is available for defining logical drives. Your entry on this screen will define the size of the first logical drive. This will become drive E, since the primary DOS partition in this example hard drive has already been assigned to drive identifier D.

Let's say you enter 20, as shown in Figure 8.7. This creates logical drive E, containing 57% of the available 35Mb in this extended partition. Since all available space in the extended partition has not been used, the resulting screen (see Figure 8.8) lets you assign the remaining 15Mb (43%). Doing so will create drive F in the extended partition.

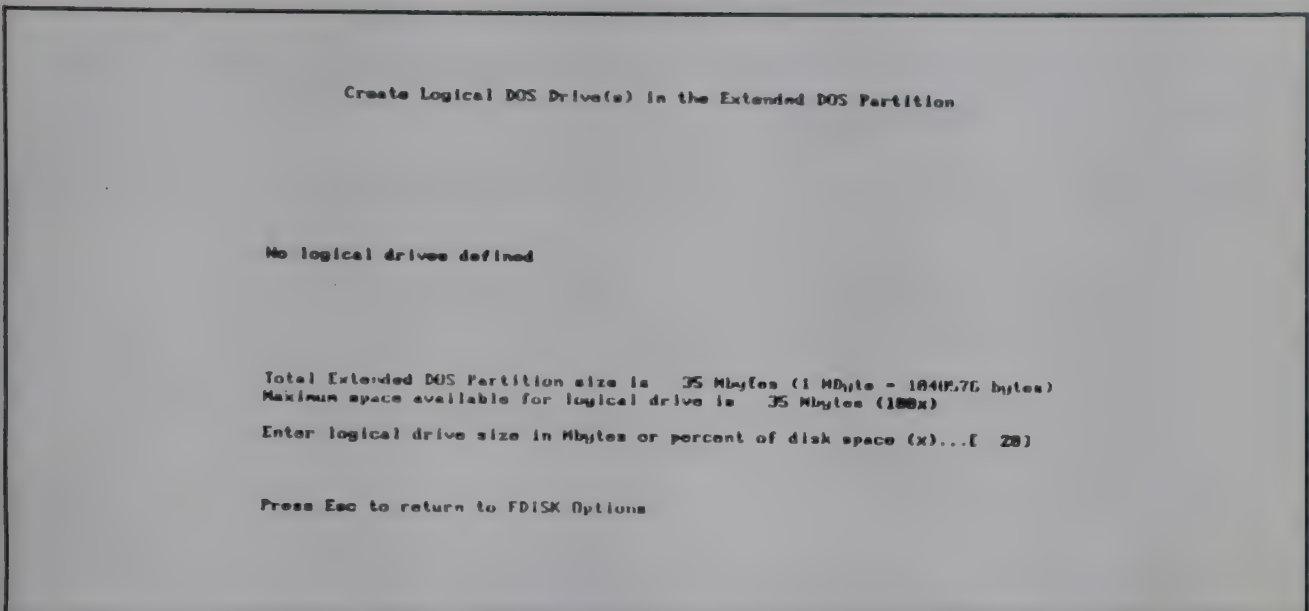


Fig. 8.7 Creating Logical Disk Drives

You can simply press Enter key to accept the default assignment of the remaining 15Mb to another logical DOS drive (F). The resulting screen (see Figure 8.9) will then contain the completed logical drive information, telling you that all of your extended partition's space has been assigned.

DISPLAYING PARTITION INFORMATION

Once you have set up partitions, you can use choice 4 on the FDISK Options menu to later display information about them. This option is useful because you don't have to execute any FDISK functions with it; you can simply look at the information (see Figure 8.10)

The information at the top of the screen should be familiar by now. In the bottom half of the screen, DOS also asks you if you want to see information about the defined logical drives. Replying with Y results in a display of all known information about these logical drives (see Figure 8.11).

This information includes individual sizes for all logical drives on this particular hard drive, as well as percentage values for those logical disks.

DELETING DOS PARTITIONS

To delete any of the partitions or logical drives you've set up on your hard disk, you should select choice 3 on the FDISK Option menu:

Delete partition or Logical DOS Drive

This displays message shown in Figure 8.12, from which you can delete any of the information you've already set up.

```

                                Create Logical DOS Drive(s) in the Extended DOS Partition

Drv Volume Label  Mbytes  System  Usage
E:                20  UNKNOWN  57%

Total Extended DOS Partition size is  35 Mbytes (1 MByte = 1048576 bytes)
Maximum space available for logical drive is  15 Mbytes ( 43%)

Enter logical drive size in Mbytes or percent of disk space (%)...[ 15]

Logical DOS Drive created, drive letters changed or added

Press Esc to return to FDISK Options

```

Fig. 8.8 Creating Logical Disk Drives

```

                                Create Logical DOS Drive(s) in the Extended DOS Partition

Drv Volume Label  Mbytes  System  Usage
D:                44  FAT16    52%
E:                40  FAT16    48%

All available space in the Extended DOS Partition
is assigned to logical drives.
Press Esc to continue_

```

Fig. 8.9 Final Status of Logical drive

```

                                Display Partition Information

Current fixed disk drive: 1

Partition Status   Type   Size in Mbytes   Percentage of Disk Used
C: 1               A     PRI DOS           40               31%
    2               EXT DOS          84               66%

Total disk space is 127 Mbytes (1 Mbyte = 1048576 bytes)

The Extended DOS Partition contains Logical DOS Drives.
Do you want to display the logical drive information (Y/N).....? [Y]

Press Esc to return to FDISK Options

```

Fig. 8.10 Displaying Partition Information

```

                                Display Logical DOS Drive Information

Drv Volume Label  Mbytes  System  Usage
D:                44  FAT16    52%
E:                40  FAT16    48%

Total Extended DOS Partition size is 84 Mbytes (1 MByte = 1048576 bytes)

Press Esc to continue_

```

Fig. 8.11 Logical DOS Drive Information

You may wish to expand or contract other partition's or you may no longer want to use a partition in the manner you originally planned. In any case, you can only make changes in a certain order. For example, you cannot delete the primary DOS partition without first deleting the extended DOS partition. If you tried to do so, SETUP would display a message informing you that you cannot delete a

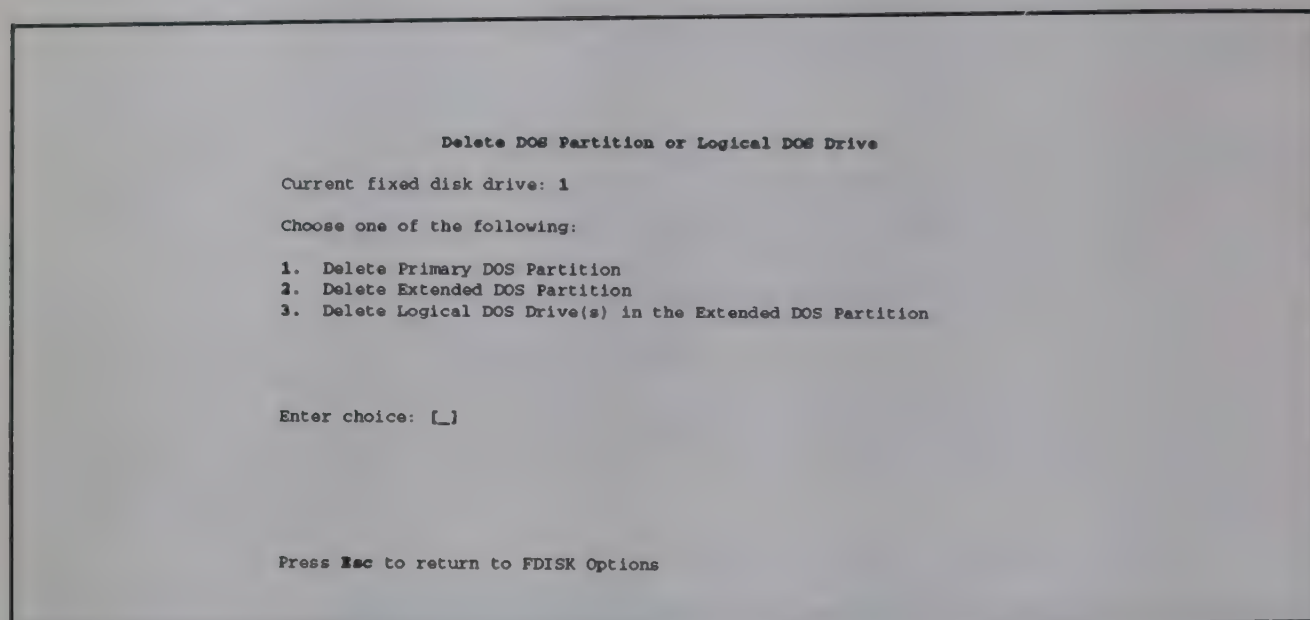


Fig. 8.12 Deleting DOS Partition

primary DOS partition when an extended DOS partition exists.

You also cannot delete an extended DOS partition without first deleting the logical drives in that partition. Trying to delete the extended DOS partition before deleting the drives in it will simply display the current partition information with a message informing you that FDISK cannot delete extended DOS partition information while logical drives exist.

Choice 3 in the Delete DOS Partition or Logical DOS Drive menu is probably the first selection you will need to make. You must work backward from the order in which you created things. When you select choice 3, a screen appears containing the logical drive information and the size of the extended DOS partition. You are also warned that any data contained in the logical disk drive will be destroyed (see Figure 8.13).

If you still want to delete the drive, enter its drive identifier. You will then be asked to enter the logical drive's volume label if it has one. You must enter the correct label, otherwise FDISK will not delete the logical drive. If it has no volume label, simply pressing **Enter** key will suffice. In this example, the drives have never been assigned a volume label, so no entry is necessary for this field. Lastly, you will be asked to explicitly confirm the deletion request. Enter **Y** to do this. If you enter **N**, the deletion request is effectively cancelled, and control returns to the FDISK Options menu.

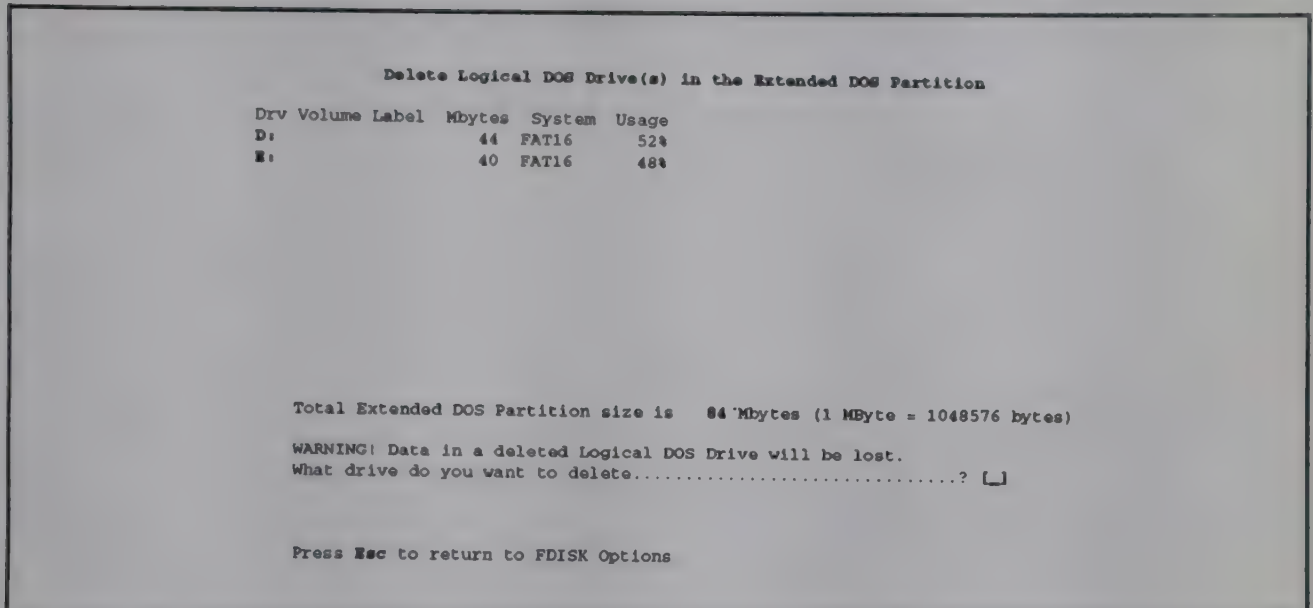


Fig. 8.13 Deleting Logical Partition

Figure 8.13 displays the entire deletion sequence just described. Once FDISK deletes logical drive F, it updates the display at the top of the screen. If you have any remaining logical drives in your extended partition, FDISK asks you whether you want to delete another drive. You would then repeat the same procedure to delete another drive. When the last logical drive is deleted, as seen in Figure 8.14, the display indicates which drives have been deleted and informs you that all the logical drives have been deleted from the extended partition.

Pressing Esc key twice at this point will bring you back to the main FDISK Options menu. Now that the logical drives are gone, you can delete the extended DOS partition itself by choosing option 3 on the FDISK Options menu and then option 2 on the Delete DOS Partition or Logical DOS Drive menu. As Figure 8.15 shows, you are warned that data will be lost, and asked if you really want to delete the extended DOS partition.

If you reply Y, the screen will be updated to show only the primary DOS partition and a message that the extended DOS partition has been deleted. Press Esc key to return once again to the FDISK Options menu. You can now delete primary DOS partition and then repartition hard disk as you deem fit.

At this point, of course, you would turn to the beginning of this chapter to carefully guide yourself through the recreation of one or more partitions and logical disk drives. Give careful thought at this point. Deciding on one or more partitions, or one or more logical disk drives, can make all your subsequent work with DOS 6 both easy and comfortable.

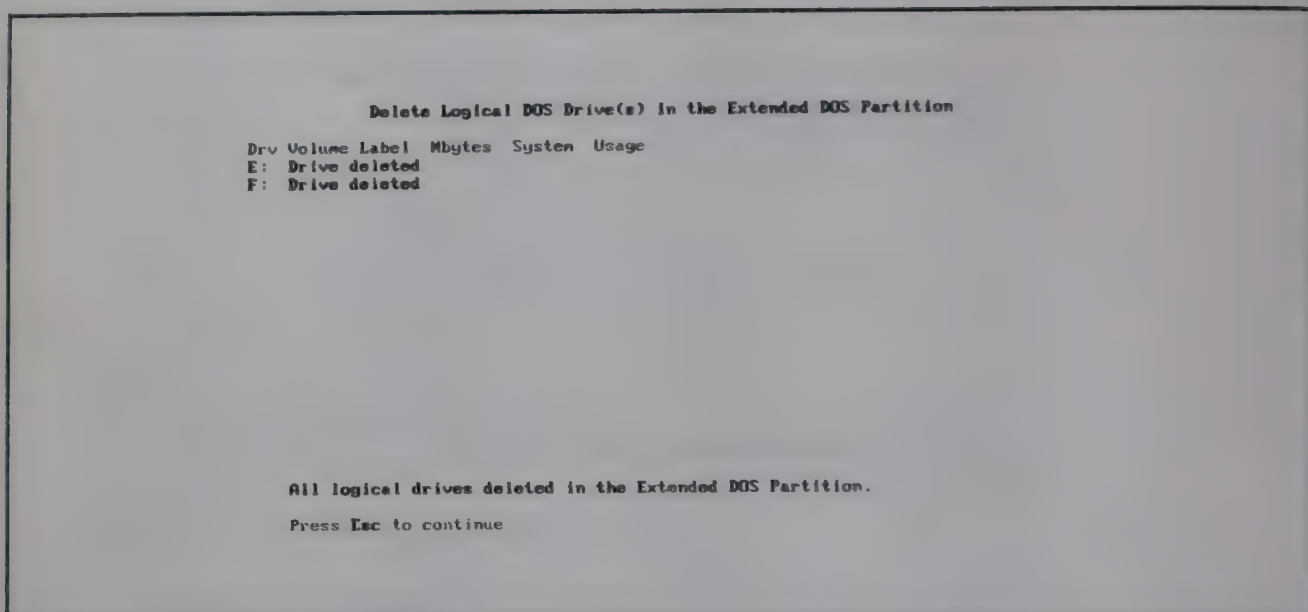


Fig. 8.14 Deleting Logical DOS Partition

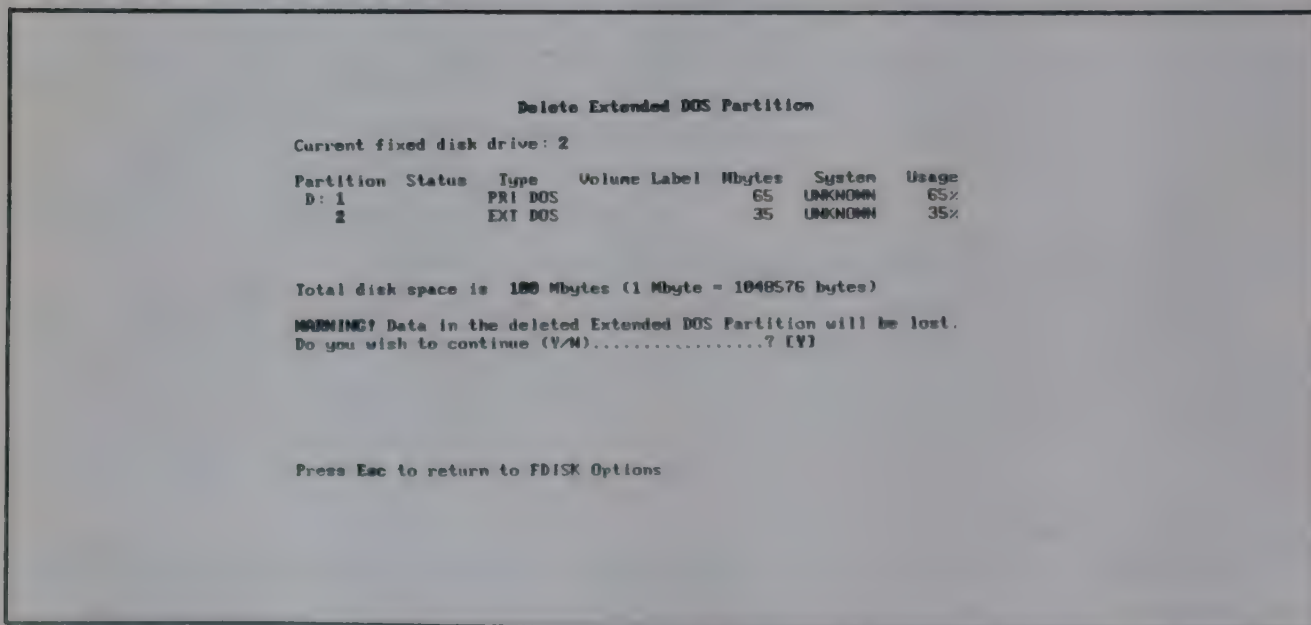


Fig. 8.15 Deleting Extended DOS Partition

Chapter 9

PREPARING FOR THE WORST

INTRODUCTION

In this chapter, you will make an emergency backup disk so that you can restart your computer if the hard disk becomes unreadable. Although this is a very unlikely event, the hard disk can become screambled if the electrical power fails while you are using it. This is called a hard-disk crash, or crash for short. The results will be disastrous if you are not prepared for this eventuality.

HOW TO FORMAT A SYSTEM DISK

The disk you need to start your computer must have four DOS 6 files on it—IO.SYS, MSDOS.SYS, DBLSPACE.BIN, and COMMAND.COM. These are the DOS 6 system files, and so a disk that has these files is called a system disk. The first three of these files are hidden. You can see hidden files from the DOS prompt by giving the command.

```
dir/ah:
```

To make your crash disk a system disk from the DOS Shell, follow these instructions:

- (a) Get a new disk and write DOS 6 CRASH on the label.
- (b) Put the new disk in drive A.
- (c) Pull down the File menu and select Run.
- (d) Type the command

```
format a:/s/v
```

and press Enter key to tell DOS you want to format a system disk.

- (e) Press Enter a second time to begin formatting the disk.
- (f) When the formatting ends, you are asked for a label name for the disk. Type

```
dos6-crash
```

and press Enter key.

- (g) Check the summary on the screen to be sure that there are no bad sectors. (If there are bad sectors, reject this disk and take another. Go back to step (a) for this disk.)
- (h) DOS then asks if you want to format another disk. Type **N** and press Enter.
- (i) Press Enter again to return to the DOS shell.

HOW TO CHECK THE SYSTEM DISK

Check the new disk by following these steps.

- (a) Make drive A current by clicking on the icon. Notice that the file listing shows only one file i.e. COMMAND.COM because the other three files are hidden.
- (b) To see the other three files, pull down the options menu and select File Display Options.
- (c) Click on the line Display hidden/system files so that an X appears in brackets at the beginning of the line.
- (d) Click the OK button to close the dialog box.
- (e) Check that the file listing shows all four system files-- COMMAND.COM, DBLSPACE.BIN, IO.SYS, and MSDOS.SYS. (If you had not included the /s switch in the Format command, these four files would not be present.)
- (f) To turn off the display of hidden files, pull down the Options menu and select File Display Options.
- (g) Click on the line Display hidden/system files to remove the X in the brackets.
- (h) Click the OK button to close the dialog box.

HOW TO CREATE THE DOS SUBDIRECTORY

Before copying the other files to the crash-recovery disk, we need to create a subdirectory. To create the subdirectory, follow these instructions:

- (a) Click on the Directory tree.
- (b) Choose File on the action bar and pull down its menu.
- (c) Select Create Directory from the File menu.
- (d) The create Directory dialog box then appears. Type the directory name

dos

in its *New* directory name field and press Enter. (If your DOS files are in another directory, use that directory name instead of DOS.) DOS then appears in the directory tree as a subdirectory of the disk in drive A.

HOW TO COPY AUXILIARY FILES

You will now copy the CONFIG.SYS and AUTOEXEC.BAT auxiliary files from your hard disk to the floppy disk. These two files are tailor made for your system; DOS reads them each time it starts up. To copy these files, follow these steps:

Making the first Copy

- (a) Make drive C current, by typing `c:` and pressing Enter key.
- (b) Click on the root directory.
- (c) Move to the listing and click on the file CONFIG.SYS to select it.
- (d) Move the mouse cursor to the file AUTOEXEC.BAT. Alternatively, you can press Shift-F8 to turn on multiple selection. Then you can move with the cursor keys.
- (e) Hold Ctrl key and click the mouse or press the space bar to select the second file.
- (f) Check that the icons for both files are highlighted.
- (g) Pull down the File menu and select Copy.
- (h) When the Copy File dialog box appears, check that the *From* field shows the files CONFIG.SYS and AUTOEXEC.BAT and the *To* field shows `C:\`.
- (i) Press Home and type the letter A.
- (j) Press Del to delete the letter c.
- (k) Press Enter to copy the two files to the root directory of the system disk in drive A.

Making the Second Copy

You need to change all references from drive C to drive A in the CONFIG.SYS and AUTOEXEC.BAT files. However, you will also want the original versions when you restore the hard disk. Therefore, let's put an original copy in the DOS directory of disk A. To make a second copy of the two auxiliary files, follow these instructions.

- (a) If necessary, move to the file listing and select CONFIG.SYS and AUTOEXEC.BAT as you did before.
- (b) Pull down the File menu and select Copy.

- (c) When the Copy File dialog box appears, check again that the *From* field shows the files CONFIG.SYS and AUTOEXEC.BAT.
- (d) Type

a:\dos

in the *To* field and press Enter to copy the CONFIG.SYS and AUTOEXEC.BAT files to the DOS subdirectory on drive A.

HOW TO COPY THE DOS FILES TO THE SYSTEM DISK

In this section, you will copy selected DOS files to the floppy disk. But first, you have to change to the DOS directory by following these instructions:

- (a) Select the DOS directory from the directory tree of your hard disk.
- (b) Move to the file listing by pressing Tab or clicking on the slider bar.
- (c) Select the file ANSI.SYS.
- (d) Press Shift-F8 to turn on multiple selection. Check to bottom line for the word ADD.
- (e) Press A to move to the top of the listing.
- (f) Select each of the following files by moving with a cursor key and then pressing the space bar.

CHKDSK.EXE
 DEFAULT.SET
 DOSKEY.COM
 DRIVER.SYS
 EMM 386.EXE
 FDISK.EXE
 FORMAT.COM
 HIMEM.SYS
 MEM.EXE
 MODE.COM
 MORE.COM
 SMARTDRV.EXE
 XCOPY.EXE

- (g) Pull down the Options menu and select Show Information.
- (h) Check that 14 files are the selected files with a total size of about 336 kilobytes. This includes the file Ansi.Sys.
- (i) Press Esc to close the Show Information window.
- (j) Select File on the action bar and pull down its menu.
- (k) Select Copy from the File menu.

- (l) When the dialog box appears showing C:\DOS in its *To* field, press Home key.
- (m) Type the letter A.
- (n) Press Del key to delete the letter C.
- (o) Press Enter key to copy the DOS files to the crash disk in drive A.

HOW TO COPY THE BACKUP FILES TO THE CRASH DISK

Now you will copy the files needed to restore the rest of your hard disk from your backup floppy disks.

- (a) Move to the M section of the file listing by pressing the m key.
- (b) Select the first backup file

MSBACKDB.OVL

- (c) As before, press Shift-F8 to turn on multiple selection. Check the bottom of the screen for the word ADD.
- (d) Using one of the methods you learned previously, select the following files:

MSBACKDR.OVL
MSBACKFB.OVL
MSBACKFR.OVL
MSBACKUP.EXE
MSBACKUP.INI
MSBACKUP.LOG
MSBACKUP.OVL
MSBCONFIG.HLP
MSBCONFIG.OVL

For example, you can select the first file. Then move the mouse pointer to the lowest file, hold the shift key, then click the left mouse button. Then hold control while you click on the files within the block that are not to be selected.

- (e) Pull down the Option menu and select Show Information.
- (f) Check that 10 files are selected files with a total size of about 504 K bytes.
- (g) Press Esc to close the Show Information window.
- (h) Select File on the action bar to pull down its menu.
- (i) Select Copy from the File menu. The Copy File dialog box then appears displaying C:\DOS in its *To* field.
- (j) Press Home key.
- (k) Type the letter A.

- (l) Press Del to delete the letter C.
- (m) Press Enter to copy the MSBackup files to the system disk in drive A.

HOW TO CHANGE AUXILIARY FILES

You previously copied the original Config.sys and Autoexec.bat files from the root directory of the hard disk to the root directory of the crash disk you are making. In this section you will change the copies in the root directory of disk A so that you can start your computer from this disk. You need to change each reference to the hard disk (C:) to the floppy disk (A:). The instructions assume that you will be using the DOS editor EDIT. Of course, you can use another editor if you want or you can run Edit from the Run option of the File menu of the DOS command prompt.

Changing Config.Sys

Follow the next steps to change the CONFIG.SYS file in the root directory of the crash disk in drive A.

- (a) If you want to run Edit from the DOS Shell, pull down the File menu and select Run.
- (b) When the Edit dialog box appears type.

edit a:\config.sys

and press Enter. Alternatively, you can type this command from the DOS prompt. Since you started EDIT with the name of a file, the opening dialog box is skipped. Your file appears on the screen and the name CONFIG.SYS is shown at the top.

- (c) Check that the cursor is at the beginning of the file.
- (d) Pull down the Search menu and select Change. The Change dialog box appears.
- (e) In the *Find What* box, type
c:
and press Tab. (Don't press Enter.)
- (f) In the *Change To* box, type
a:
and press Tab. (Again, don't press Enter.)

- (g) The cursor is now in the Match Upper/Lowercase field. We want to leave this field blank. Then upper-and lowercase are treated the same. That is, C: and c: will then be equal. (If another time you wanted to distinguish upper-and lowercase, you would press the space bar to select this option). Press Tab three more times until you reach the <Change All> option.
- (h) Press Enter key to change all occurrences of c: to a:
- (i) When the Change complete dialog box appears, press Enter.
- (j) Check that each occurrence of c: has been changed to a:.
- (k) Disable commands ramdrive.sys, shell, and fastopen.exe by adding the command rem (for remark) to the beginning of the line. For example,


```
rem device = a:\dos\ramdrive.sys 1024 /e
rem install = a:\dos\fastopen.exe a:
```
- (l) Also, put rem at the beginning of any line that starts with DEVICE HIGH.
- (m) Pull down the File menu and select Save. You could now exit back to DOS, but let's change Autoexec.bat first.

CHANGING AUTOEXEC.BAT

To change the Autoexec.bat file on the root directory of the crash disk in drive A, follow these steps.

- (a) Pull down the File menu and select Open.
- (b) When the Open dialog box appears, type


```
a:\autoexec.bat
```

 and press Enter.
- (c) Check that the cursor is at the top of the file.
- (d) Pull down the *Search* menu and select *Change*. The change dialog box appears. The previous values should still be there.
- (e) Check that the Find What box still has c:. Change it if not.
- (f) Check that the Change to box still has a:. Change it if not.
- (g) Press Tab five times to select Change All.
- (h) Press Enter to make the changes.
- (i) When the Change complete dialog box appears, press Enter.
- (j) Check that each c: has been changed to a:.
- (k) Look for the command defining the search path. If it looks something like


```
path a:\dos: a:\until
```

 change it to


```
path a:\dos
```


- (l) Delete any lines beginning with the command COPY.
- (m) Delete the line with the UNDELETE command, if it exists.
- (n) Delete lines with Set, Temp, or LH.
- (o) Pull down the File menu and select Save.
- (p) Pull down the File menu again and select Exit.

TRYING OUT THE NEW CRASH-RECOVERY DISK

After you have finished copying and modifying the crash-recovery disk's files, restart your system with this disk to see if it works.

- (a) Switch to the command prompt with F3.
- (b) Make sure the new system disk is in drive A.
- (c) Restart your computer by pressing the keys Ctrl-Alt-Del simultaneously.
- (d) Watch the screen for error messages.
- (e) Give the command

set

and check for the lines

PATH = A:\DOS

COMSPEC = A:\COMMAND.COM

If you do not see any error messages and your PATH and COMSPEC command lines match those above, your crash-recovery disk is ready for use.

RESTARTING A CRASHED HARD DISK

INTRODUCTION

Hard disk crash means that there is some problem in the working of your hard disk. Hard-disk crash can be a disaster if you are not prepared for it. Therefore, it is prudent to be prepared in advance for malfunctioning of the hard disk.

There are two things you must do before a crash occurs: (i) back up your hard disk with the MSBACKUP program. (ii) make a crash-recovery disk by following the instructions in chapter 9. If you have done so, you can easily restore your disk by following the instructions in this chapter. The five steps for getting your hard disk working again are:

- (a) Starting the computer with the crash disk
- (b) Partitioning the hard disk
- (c) Formatting the hard disk
- (d) Copying DOS including the backup program and its files to the hard disk
- (e) Restoring the backup files to the hard disk

RESTARTING WITH THE CRASH-RECOVERY DISK

The first thing you must do after your hard disk crashed is to restart your computer from the system disk you made for this purpose. If you made a crash-recovery disk as per chapter 9, you will quickly be back in operation. However, if you did not make a crash disk, you must set up your system again by using the original DOS disks and following the instructions in your DOS users' manual. When your computer is running again, skip to the next section.

To restart the computer with your crash-recovery disk, follow these instructions:

- (a) Turn off your computer if it is on.
- (b) Insert your crash-recovery disk in drive A.
- (c) Turn on your computer and it will read the floppy disk in drive A. When you see the command prompt A:\>, you will know that the first step is successful.

PARTITIONING YOUR HARD DISK

Now you must partition the hard disk with the FDISK program, which is in your crash-recovery disk's DOS subdirectory. A *partition* is an area on the hard disk that your system treats as a drive. If you create just one partition, your entire hard disk will be drive C. This is called the primary DOS partition. If you have a disk that is larger than 80M bytes, you should create two partitions, the primary partition and the extended DOS partition. Then you can create logical disk drives in the extended partition. The primary partition contains drive C and the extended partition has additional drives named D, E, and so forth. That is, one large hard disk can be partitioned into two or more disks. You only need the primary DOS partition to run DOS from your hard disk. You can establish the extended DOS partition when you set up your disk, or you can do it at a later time. To set up the primary partition on your hard disk, follow these instructions:

- (a) Start the partitioning program by giving the command

`fdisk`

at the command prompt and pressing Enter key. The program starts up and presents a menu.

- (b) Type 4 and press Enter key to display the partition data. If you see the line

`No partitions are set active`

Your disk is ready to be partitioned, and you can skip to step (d). On the other hand, if your crashed hard disk still has a DOS partition or logical DOS drives, it is best to remove them and create new partitions.

- (c) To delete a DOS partition or logical drive, type 3 and press Enter key. Then follow FDISK's instructions for deleting the partition or logical drive.
- (d) Return to the FDISK Options menu by pressing Esc.
- (e) Type 1 and press Enter to get the Create DOS Partition or Logical DOS Drive menu.
- (f) Press Enter key to select the default option of 1, the Create Primary DOS Partition option. If your hard disk is larger than 80M bytes, you should create a primary DOS partition of 80M bytes. The remainder of the disk will be the extended partition. The primary DOS partition will become drive C and the extended DOS partition can have logical drives D, E, and so on. Since you can create the extended partition anytime, it is best to begin with drive C now. When drive C is working properly, you can run FDISK again to create other drives on the hard disk.

- (g) When you see the following message on the screen:

Do you wish to use the maximum available size
for a primary DOS partition and make the
partition active (Y/N)?

type N and press Enter key unless your disk is smaller than 80M bytes. If it is smaller, type Y, press Enter key, and then skip to step (i).

- (h) The screen now shows

Enter partition size in Mbytes or percent of disk
space (%) to create a primary DOS partition.

Type 80 and press Enter to create a 80 M bytes partition.

- (i) Press Esc to return to the FDISK Options menu.
(j) Type 2, and press Enter key to set the active partition.
(k) In response to the line

Enter the number of partitions you want to make
active

Type 1, then press Enter key.

- (l) Press Esc to return to the FDISK Options menu.
(m) Press Esc key again.
(n) Check that your crash-recovery disk is in drive A.
(o) The following message appears:

System will now restart
Insert DOS system diskette in drive A:
Press any key when ready.

Press Enter key to restart your system. You will then be returned to the command prompt on drive A.

FORMATTING YOUR HARD DISK

Now that you have established the primary partition of your hard disk, you need to format it. Be careful not to accidentally format your system disks in drive A, or you will destroy your crash-recovery disk. Run the FORMAT program from the command prompt to reformat a crashed hard disk.

- (a) Give the command

`format c:/s`

The FORMAT program destroys data on the disk. Therefore, you must be careful not to format an undamaged hard disk. To prevent you from doing this, FORMAT gives you a warning in case you meant to format a floppy disk but gave the hard-disk drive letter 'C' by mistake.

- (b) When you see the message:

```
WARNING, ALL DATA ON NON- REMOVABLE
DISK DRIVE C: WILL BE LOST ! Proceed with Format
(Y/N)?
```

Type Y and press Enter key. The message

```
Formatting...
```

will appear on the screen, and the activity light on the hard disk will be lighted. The percentage of the disk that has been formatted is shown on screen as the formatting progresses. The process may take several minutes. The /S switch in the FORMAT command adds a copy of the DOS system to the hard disk. Then you will be able to start up your computer directly from the restored hard disk.

- (c) When you see the message:

```
Volume label (11 characters, ENTER for none)?
```

Type something that identifies your computer, such as your name, department name, or office number. DOS then labels the hard disk and automatically assigns it a unique (volume) serial number.

- (d) After formatting is finished and you have selected a volume name, you will see on the screen a summary of disk and memory usage. The first number after the heading gives the total disk space. The next lines show more information about the memory usage, and the next-to-last line displays your hard disk's serial number. Look for a line giving the number of bad sectors. There may not be any at all. However, if there are, they should not total more than 50K bytes.
- (e) With the last line, DOS asks you if you want to format another disk. Type N and press Enter to return to the command prompt.

CHANGING THE DOS DEFAULT DRIVE TO C

In this section you will make the newly formatted hard disk the default DOS disk.

- (a) Give the command

```
set comspec = c:\command.com
```

- and press Enter. Now you no longer need to keep the crash disk in drive A.
- (b) Give the command

path c:\dos

and press Enter key. Now DOS will look for its files in the DOS subdirectory in the hard disk.

- (c) Give the command

set

and check for the lines:

COMSPEC = C:\COMMAND.COM

PATH = C:\DOS

COPYING THE CRASH-DISK FILES TO THE HARD DISK

In the section you copy the DOS files including the important MSBACKUP files needed to read your backup disks.

- (a) Check that drive A is current.
- (b) Change to the DOS subdirectory with the command:

cd dos

- (c) Change to the hard disk with the command

c: ..

- (d) Create the DOS subdirectory on the hard disk with the command

md dos

- (e) Change to the DOS subdirectory on your hard disk with the command:

cd dos

- (f) Copy the programs for the crash disk with the command:

copy a:*.*

RESTORING THE FILES TO DRIVE C

Now you can restore the files to drive c by running the MSBackup program.

- (a) Get out your backup files for drive C.
- (b) Begin with the most recent full backup. You can retrieve the catalog from the last disk in the series.

- (c) After restoring the files from the full backup, repeat the procedure with any incremental or differential backups made after the most recent full backup.
- (d) After the last disk has been restored, put your backup disks away in a safe place.
- (e) Restart your computer by pressing Ctrl-Alt-Del.
- (f) Type the command

set

at the command prompt and press Enter key. Check that the lines:

```
COMSPEC = C:\COMMAND.COM  
PATH = C:\DOS;C:\UTIL  
PROMPT = $P$G  
DIRCOM = /O
```

are displayed.

- (g) Run the CHKDSK program to see that everything is working correctly.

Now your computer is running again. Keep your crash-recovery disk and continue to back up your files regularly in case your hard disk ever crashes again.

CREATING THE EXTENDED DOS PARTITION

In the remaining sections of this chapter you will restore the remaining logical drives of your hard disk by creating an extended partition. If your hard disk is smaller than 80M bytes, skip over the remainder of this chapter.

If your Config.sys file creates a RAM disk with RAMDRIVE.SYS, DOS will assign the next drive letter after your last hard disk. If before your hard disk crashed, it held logical drives C and D, then the RAM disk was assigned letter E. However, in restoring your hard disk, you have not yet created the extended partition and so there is only one drive and that is C. Consequently, the RAM disk is assigned the letter D. A problem may occur if you run a program that expects to find the RAM disk as drive E. Therefore, put the statement *rem* at the beginning of any Ramdrive statement in the Config.sys file. Then restart your computer. Before you can assign logical drives starting with D, you have to create an extended partition. To do that, follow these steps:

- (a) At the command prompt, start the partitioning program again by giving the command:

fdisk

and pressing Enter key. The program starts up and presents the menu.

- (b) Type 1 and press Enter key to get the menu Create DOS Partition or Logical DOS Drive.
- (c) Type 2 and press Enter key to get the Create Extended DOS Partition menu.
- (d) Fdisk asks if you want to assign the remaining disk space to the extended partition. This is the default response. (If you want to run another operating system in addition to MS DOS, you must leave room for another partition.) Press Enter key to assign the remaining space to the extended partition. (You cannot have more than two DOS partitions, primary and extended.)

CREATING LOGICAL DRIVES IN THE EXTENDED DOS PARTITION

After you create the extended partition, you are automatically given the Create Logical DOS Drive(s) in the Extended DOS Partition menu. Now you can create logical drive D. If the total hard disk size is greater than 160M bytes, you should make logical drive D of the size 80M bytes and then later assign the remaining space to drives E, F, and so forth. Then you will not have any logical drive larger than 80 M bytes. On the other hand, if your hard disk is smaller than 160 M bytes, you should allocate the remaining space to drive D.

To create logical drives in the extended partition, do the following:

- (a) The Create Logical DOS Drive(s) in the Extended DOS Partition menu will be on the screen if you just created the extended DOS partition. On the other hand, if you are restarting FDISK, select item 1, Create DOS Partition or logical DOS drive. Then select item 3, Create logical DOS drive(s) in the Extended DOS partition.
- (b) If there is more than 80 M bytes of space in the extended partition, set the first logical drive (D) to be 80 M bytes, otherwise assign all remaining space to drive D.
- (c) Give drive D a meaningful name such as CAD or just use the name SECOND.
- (d) As long as there is more than 80 M bytes of available space, assign 80 M bytes to each logical drive in order and choose meaningful names.
- (e) Finally, when there is less than 80 M bytes of space left, assign all remaining space to the next logical drive.
- (f) Press Esc to leave the FDISK program. Ignore the message to insert a DOS diskette in drive A since your drive C is bootable. Now your computer will restart using drive C.

FORMATTING THE LOGICAL DRIVES IN THE EXTENDED PARTITION

After establishing the logical drives in the extended partition, you must separately format them. Be careful not to accidentally format the primary partition (drive C). Run the FORMAT program from the command prompt as you did before.

- (a) To format the first logical drive in the extended partition (drive D), give the command

```
format d:
```

The FORMAT program destroys all data on the disk. Therefore, you must be careful not to format an undamaged hard disk. As you learned previously, FORMAT gives you a warning in case you meant to format a floppy disk but gave the hard-disk letter by mistake.

- (b) When you see the message

```
WARNING, ALL DATA ON NON-REMOVABLE DISK  
DRIVE D: WILL BE LOST !  
Proceed with Format (Y/N)?
```

type **Y** and press Enter. The message

```
Formatting...
```

will appear on the screen, and the red light on the hard disk will be lighted. The percentage of the disk that has been formatted is shown on screen as the formatting progresses. The process may take several minutes.

- (c) When you see the message

```
Volume label (11 characters, ENTER for none)?
```

type a meaningful name.

- (d) When the formatting is finished, check the display for the number of bad sectors. As before, if there are any, they should not exceed 50 K bytes.
- (e) With the last line, DOS asks you if you want to format another disk. If you created additional logical drives, type **Y** and press Enter key to format them in the same way.
- (f) After you have formatted all the logical drives in the extended partition, type **N** and press Enter key when asked if you want to format another disk. You will be returned to the command prompt.

RESTORING FILES TO THE LOGICAL DRIVES

If you have backup disks for the logical drives D, E, and the rest, restore them now.

- (a) Get out your backup disks for drive D.
- (b) Restore the files as you did for drive C.
- (c) If you have partial backups, restore the files from them next.
- (d) After the last disk has been restored, put your backup disks away in a safe place.
- (e) Repeat the procedure for any other drives.
- (f) If your config.sys creates a RAM disk and you had put the statement *rem* at the beginning of the RAMDRIVE statement in your config.sys, remove the word *rem*.
- (g) When all drives have been restored, restart your computer by pressing Ctrl-Alt-Del.
- (h) Type the command

set

at the command prompt and press Enter key. Check that the lines:

```
COMSPEC = C:\COMMAND.COM
PATH = C:\DOS;C:\UTIL
PROMPT = $P$G
DIRCOM = /O
```

are displayed.

CHECKING THE LOGICAL DRIVES

Start the DOS Shell and check that the drive icons correspond to the number of logical drives you created. Also check for a RAM disk icon if you have the RAM-DRIVE command in your CONFIG.SYS file.

Now that your hard disk is working again, remember to make frequent partial backups. Also, make complete backups more often and keep at least two consecutive backups.

WORKING MORE EFFICIENTLY WITH DOS 6

THE WORKSPACE

If you keep your computer workspace organized, you will be able to use your computer easily. Make sure all necessary documentation, blank disks, computer programs etc. are available. Make a list of the steps needed to start up your computer and then keep that list by the side of the computer. Here is a list of items:

- (a) Computer log book
- (b) Crash recovery disk
- (c) Disks for application programs
- (d) New floppy disks
- (e) Printer paper
- (f) Printer ribbons or toner cartridge for lazer printer
- (g) Envelopes
- (h) Computer manual
- (i) Manuals for application programs and DOS 6 & 6.2 companion

To create your computer log, buy a bound notebook. In it, keep a chronological record of procedures and hardware changes. Record the details needed to start up your computer. If you change the DOS version, note the date and version number. When you configure a program such as WordStar or Side-Kick, record the features you selected. Also record the switch settings on the printer.

FLOPPY DISKS

Floppy disks are magnetic media. Therefore, do not place them near a magnetic field or a steel object that might be magnetized. Magnetic fields can be produced by telephones, screwdrivers, steel desks, and other steel objects. When travelling by air, do not place disks in your luggage. Carry them by hand and be sure to ask for a separate inspection when you board the plane. Do not let the disks be X-rayed, since the X-ray machine creates a magnetic field.

Always place disks in their jackets when you are not using them. Do not expose them to dust or smoke. Be especially careful if you live in a dry climate because disks can accumulate a static charge that makes dust stick to the surface,

Do not touch or clean the disk surface or open the outer cover.

You should always place a label on each disk. Write something on the label that will remind you of the contents. For example, choose descriptive names like MEMOS, QUARTREP. Never write on a 5 1/4-inch disk with a pen, pencil, or other sharp object because the pressure can damage the surface. Instead, use a felt-tipped pen, or write on the label and then apply it to the disk. Do not bend disks or expose them to heat or direct sunlight.

Damage To The Disk Surface

The surface of a disk can be damaged either magnetically or mechanically. A region can be incorrectly magnetized, or there can be a defect such as a scratch in the surface. It may be possible to correct a magnetic fault with FORMAT. However, if the surface is damaged, the disk should be discarded. A hard disk can automatically find faulty areas and mark them as unusable.

THE PRINTER

A computer printer will work very reliably for months or even years without needing attention if it is treated with care. Read the manual for your printer so that you can understand what settings you need and how to change them. If your printer is slow, you may be tempted to walk away from the computer while it is printing. Be sure you check the operation often to see that everything is in order. This is especially important at the start, because the paper might be jammed in the printer. You should always be present when printing adhesive labels, since they are more likely to jam the printer.

If the printer does not work when the system is turned on, check all printer settings. In particular, check that the online/local switch is set to online. Also, check that the cord from the computer to the printer is in place.

DISK FILES

Be sure to format a new disk before you use it for the first time. Always make a backup copy of any new program or disk before it is first used. Then put the original away in a safe place. If you have an office computer, keep the backup disks at home. If you have a home computer, keep the backups at the office.

There is a limit to how much information can be stored on each disk as well as to the available number of directory entries. As more and more files are saved on a disk, the free space can become exhausted. Another problem can arise if a

single file is larger than the capacity of the disk. For fastest editing and duplication, file size should be limited to 40-50K bytes.

Before you edit a file on a floppy disk, use the *Show Information* choice on the Options menu to determine the file size and the remaining disk space. If you want the edited file to be placed on the same disk as the original, there must be sufficient room. In fact, the remaining space on the disk should be more than the size of the original file because the editor may need some working space. For example, if the file to be edited is 40K bytes long, the disk should contain at least 60K bytes of free space in addition to the original file. If there is not enough space, you can tell the editor or place the new version on a different disk from the original file.

RECOVERING FROM SYSTEM FAILURE

When you are trying to determine what caused your system to fail, follow the sequences of operations given below:

- (a) Check the mechanical items.
 - (i) Are all cables attached, with no loose connections?
 - (ii) Are all cables in the correct place?
- (b) Did you give the correct command?
 - (i) Remove floppy disks and turn everything off.
 - (ii) Turn the computer on.
 - (iii) Repeat the command.
- (c) Make sure that you are using the correct program, the correct DOS version, and that the program you are trying to use is on the disk you are using. If it is so then suspect the disks.
- (d) Use a fresh disk if it is a floppy. The current disk may have been damaged.
 - (i) Use a backup disk. Do not use any program on your current disk.
 - (ii) If no backup exists, take time to make one.
- (e) Use the back up disk to restore your program files and data files.

Still, if you find that the system is not booting or the program is not loaded, then you should segregate whether it is a hardware or a software problem. If you have a spare booting disk, check the booting by inserting the spare booting disk in drive A: and close the door. In case, the system does not boot up, i.e., you do not get A> on the monitor after the system is switched on, it is an indicator of the hardware defect. If your machine is with in warranty period, call the company mechanic. If the computer is not under warranty and you want to give it a bit of

your help, then do the following:

- (a) Check the power supply chord. Is it properly inserted at the switch board and in the computer male plug.
- (b) Open the cover of the computer and check if any wire is loose. If some mouse has eaten wires, better then it is to take your machine to the company for repairs.
- (c) If all the wires are intact, then check whether the monitor cable is connected to the computer out let properly. There is a video output in the computer outer panel. One cable of the monitor should be connected there. The other cable should be inserted in the power supply socket. If the monitor light comes on but the A> (A prompt) does not appear, the fault could be in the monitor also. Get it repaired by the supplier.
- (d) If the A> (A prompt) comes correctly but the software (application program) is not working properly, you will need the help of your friend who is working on a similar software. You may have to reload the software on the machine and then start all over again. The best method is to refer to the error message section of the application software documents. For example if you are working in Lotus 1-2-3 and there is error then look into the manual of Lotus 1-2-3 for correcting the problem.
- (e) Lastly, it is possible that your software hard disk or booting disk is infected by a virus. To know more about it, you should read chapter 15 of this book and try to remove virus using MSAV utility of DOS 6 & 6.2.

ANSI.SYS AND IT'S USES

INTRODUCTION

One of the most misunderstood and seldom-used goodies that comes with DOS is the ANSI.SYS driver. What it does is give you access to a series of codes that can control display on the monitor and change keyboard. It's really quite versatile, and you can do amazing jobs with it. ANSI.SYS is covered in the following three parts:

- (a) The ANSI.SYS device driver
- (b) The ANSI codes
- (c) Using ANSI.SYS

THE ANSI.SYS DEVICE DRIVER

ANSI.SYS device driver is included with every version of DOS including DOS 6. What ANSI.SYS does is to give you access to the ANSI control codes, a commonly defined set of instruction for controlling your screen and keyboard. By loading the ANSI.SYS device driver in your CONFIG.SYS file, the DOS program can take advantage of these codes.

ANSI.SYS controls your screen and keyboard by letting you take advantage of ANSI control codes.

To install ANSI.SYS and take advantage of its features, you add a line such as the following to your CONFIG.SYS file:

```
DEVICE = C:\DOS\ANSI.SYS
```

This assumes ANSI.SYS is in the \DOS subdirectory on Drive C. If your ANSI.SYS file is elsewhere, remember to specify its full path in CONFIG.SYS. After entering the above line, reboot your system to re-load CONFIG.SYS and let the changes take effect.

THE ANSI CODES

ANSI stands for the American National Standards Institute. It's an institute that defines a number of computer standards, most of which are ignored by mainstream personal computing.

The ANSI.SYS driver uses the ANSI standard codes for controlling the screen and keyboard. These are a series of instructions that do a number of things, most of which are listed below:

- (a) Manipulate the cursor on the display.
- (b) Erase a line of text or the entire screen.
- (c) Set the graphics mode.
- (d) Change the color of text.
- (e) Reassign keys and characters on the keyboard.

Basically what the ANSI codes do is give you control that DOS doesn't have directly over the display. There are no DOS commands to "move the cursor up one line" or to change the screen color. ANSI does that for you. (But only if you load the ANSI.SYS driver in CONFIG.SYS.)

ANSI also allows you to reassign keys on the keyboard, plus assign strings of text to certain keys. You can totally re-define the function keys in DOS having them strings of text when you press them.

The ESCape Sequence

ANSI codes themselves are a series of characters, primarily letters, numbers and symbols used to indicate what you want to be done. It's cryptic. In fact, a few people get into ANSI only because the codes don't make any sense and are hard to memorize. The toughest part of all is the prefix for each code, called an *escape sequence*.

ALL ANSI codes start with an escape sequence. That's the ESC character, code 27 produced by pressing ESC or Control-[, followed by a left bracket, [.

The problem with the escape sequence is the ESC character. Pressing ESC doesn't usually produce that character. Instead, the ESC key could change the mode in your text editor, it could erase a line of text, or it could do a number of things none of which is to display the ESC character (which looks like "<-" on the screen). But there are solutions. Quite a few word processors and text editors allow you to enter the ESC character (and other "control" characters) by using a prefix key. In *WordStar* (and other *WordStar*-like editors), the prefix key is control-P. So

to insert an ANSI escape sequence in *Wordstar* you would type:

```
Control - P ESC [
```

In QEdit, a wordstar-like text editor this produces the following on the screen:

```
← [
```

The control -P is the "literal prefix", meaning the next character you type will be inserted as-is in the text.

In *Word Perfect* you can use the control -V prefix to insert a literal character. To enter the ANSI escape sequence in *Word-Perfect*, type:

```
Control - V ESC [
```

This produces "^[" on the screen, ^[being the symbol for ESCape. But if you use *Wordstar* and *Word Perfect*, remember to save the document in the text-only or ASCII format. Other codes used by word processors may interfere with the ANSI driver's interpretation. Finally, many text editors have a special prefix key for entering control characters. In EDLIN, DOS's text editor, the prefix command is Control-V, But it doesn't work like *WordPerfect*. To enter an ANSI escape sequence in EDLIN, you can type the following:

```
Control - V [
```

The control- V is a control-code character prefix. It inserts a ^V into the document, but it's used to convert the following character into a control code. In this case, [is converted into ^[, which is an ESCape.

ANSI COMMANDS

ANSI commands are of two types; those that control your screen and those that control the keyboards. A complete list of all the ANSI commands available under DOS's ANSI.SYS driver is provided in ANSI.SYS Command in DOS 6 manual.

Erase Display

The Erase Display command is used to clear the screen. It has the same results as CLS command:

```
← [2J
```

The escape sequence is followed by 2J, the actual ANSI codes that clear the screen. This is one of the simplest codes.

Position Cursor

The position cursor command will move the cursor to any location on the screen. This is handy for precise control of text location in batch files and when building menus. The commands is:

```
← [row; column H
```

Row and *column* are the row and column to which you want the cursor moved. Notice that they're separated by a semicolon and a capital H ends the command. The *row* values range from 1 through 25 for the top through bottom rows. The *column* values range from 1 through 80 for the left to right columns.

Set Graphics Rendition

The set Graphics Rendition command is the one that sets the colors on your display. Its format is:

```
← [nm
```

The following *n* values are used for color monitors to create color text. Note that the value is listed in the table by row and column depending on what color sets and whether the color is a foreground (text) color or a background color.

You can mix and match the attributes by specifying more than one in the set Graphics Rendition command. Separate each number by a semicolon and follow the last one with a lower-case M.

For example, to specify bright white letters on a blue background the following command is used.

```
← [1;37;44m
```

This command specifies high intensity text (1) white foreground text (37) and blue background (44).

To return the text to standard DOS plain white on black, low intensity text, use the following:

```
← [Om
```

Making It Work

You know about escape sequences and you've seen some ANSI commands. But how do you get them to work. You have to somehow display them on the screen. In batch files, the ECHO command can be used to do this.

```
ECHO ← [1;37;44m
```

nValue	Color	Monochrome
0	Normal	Normal
1	High intensity	High intensity
2	Normal intensity	Normal intensity
4	Blue	Underline
5	Blinking	Blinking
7	Inverse video	Inverse video
8	Invisible	Invisible

Fig. 12.1 Graphicsrendition text attributes

Color	Foreground	Background
Black	30	40
Red	31	41
Green	32	42
Yellow	33	43
Blue	34	44
Magenta	35	45
Cyan	36	46
White	37	47

Fig. 12.2 Graphicsrendition text colors

Or ANSI codes can be embedded into a text file. In that case, simply TYPEing the file to the display causes the commands to be executed.

Another alternative is to use the PROMPT command. Prompt allows ANSI escape sequence to be embedded using its \$e command. To change the color of your DOS prompt to bright white on blue, you could use the following:

```
PROMPT $e[1;37;44m$p$g
```

The ANSI escape sequence is `$e[`. Here `$e` meaning ESC. The rest of the code are the ANSI codes to set Graphics Rendition. And `$p$g` sets the prompt to the current path and a greater-than symbol.

A lot of people use PROMPT to get at the ANSI commands. It is the only convenient way to enter them on the command line without resorting to TYPEing a text file or writing batch files. But it's clumsy and fills up the environment needlessly.

USING ANSI.SYS

The following are examples of using ANSI.SYS. They cover the major things ANSI.SYS can do using these examples. You can take advantage of ANSI codes while using your PC.

Menu Text File

A lot of people use batch files to run simple menu system on their PC. One way to display the menu options is to use endless ECHO commands in a batch file TYPE the menu to the screen. If you have ANSI codes in the text file, those will affect the screen as well. The following text file example displays a color menu in the 40-column mode:

```
← [2J
← [ = 1h
← [5;15H M A I N M E N U
← [8; 10H 1. Word processing.
← [10; 10H 2. Spreadsheet
← 12; 10H 3. Telecommunications
← [14; 15H Enter choice:
```

In this example, the ANSI commands are separated, each on a line by itself. This doesn't have the case; ANSI commands can be strung together as long as you like.

Line 1 clears the screen

Line 2 sets the display mode to 40 columns (for color systems only).

Line 3 through 7 use the ANSI cursor-positioning commands to position the menu items on the display.

If you wanted a color menu, you should add the color command in the first line. Before the screen clears, ANSI will then clear the screen with the desired color and all subsequent text will also appear as that color.

To make this file work, it needs to be saved to disk, for example to MENU.TXT. Then your batch file can just TYPE MENU.TXT or use COPY MENU.TXT CON to make ANSI do its thing.

Spicing Up The Prompt

ANSI commands are placed into the prompt using the \$e command. This is most often used to give color to DOS. For example the following prompt always sets DOS text colors to bright blue on white:

```
PROMPT $e [1;37;44m $p$g
```

If you prefer other colors, they can be inserted in the prompt as well. But by far the most complex prompt is the screen update prompt.

The screen update prompt displays the current directory and the date and time at the top of the screen. It makes heavy use of ANSI commands to move and position the cursor, as well as change color. Here's the prompt:

```
PROMPT = $e[s$e[1;1H$e[7m$e[K$e[1;45 H$d @ $t $e[Om$e[u$g
```

Command	Function
\$e[s	Save the current cursor position
\$e[1;1H	Home the cursor
\$e[7m	Set inverse video on
\$e[k	Erase that line, set inverse video
\$p	Print the current directory and path
\$e [1;45H	Move the cursor to just past the middle screen, top row
\$d	Display the date
@	Display a space, then the "at" character
\$t	Display a space, then the current time
\$e[0m	Change the color back to normal video
\$e[u	Restore the cursor position
\$g	Display a > character, followed by an optional space

Fig. 12.3 ANSI and PROMPT commands.

Briefly, the prompt will constantly display the current directory and path plus the date and time at the top of the screen. The system prompt is then a greater than

symbol. It is informative and fun to look at. And it's only possible with ANSI.SYS.

Re-assigning Keyboard characters

ANSI's keyboards control lets you do two things:

- (a) Assign a character to any key on the keyboard.
- (b) Assign a string of text to any key on the keyboard.

What ANSI keyboard reassignment does is to replace the character displayed when you press a key with some other character. Note that this only works at the DOS prompt, or with programs that use DOS's functions for input. Normally this excludes all mainstream application.

For example, you can write a command to cause the symbol to be displayed each time you press the * key. Such a command would look like this:

```
@ echo ← [42;254p
```

The format for ANSI's Keyboard key Reassignment is:

```
← [ oldkey;newkeyp
```

Oldkey is the ASCII value of the keyboard key you're reassigning. *Newkey* is the ASCII value of the character you want displayed when you press *oldkey*'s. In the previous example the asterisk has an ASCII value of 42. The block character has an ASCII value of 254.

Any two keys can be swapped this way. And you can swap any key combination as well including Shift, control and Alt key combinations. To properly replace function keys and Alt-key combinations, you need to know a key's *scan code*. You then use that scan code value instead of the ASCII value when redefining the keyboard.

For example, the scan code value for the Alt-F1 key is 0, 104. (It's two values). To reassign the letter "G" to Alt-F1, you use the following:

```
← [ 0, 104;71p
```

This reassigns G, ASCII 71 to the Alt-F1 key, scan code 0, 104. If you merely want to swap two ASCII characters, you can just put them in quotes. For examples:

```
← [ "MN"p
```

The above command causes the character "N" to be produced when you type the M key. Note that this is for upper case only. To re-assign key's lower cases as

well. you needed to use second command:

```
← ["mn"p
```

These commands can be put into a text file that can be TYPED to the screen, or you can write a batch file that will execute them, changing keys on your keyboards. Such a batch file is described in the next section.

Text to Function Keys

Reassigning a single key requires a bit of head scratching; exactly what is it good for? But reassigning a whole string of characters to a single key can have lots of use. That's the second of ANSI's two keyboard reassignment commands, Keyboards String Reassignment.

The format for keyboard String Reassignment is almost the same as for single key reassignment. The difference is that *newkey* is replaced by a text string in quotes.

```
← [key;" string" p
```

Here, *key* is the ASCII code of some character representing a key on the keyboard. *String* is a string of characters that will be displayed when you type that key.

For example the ASCII code for the + (plus) key is 43. To have the string "plus" displayed each time you press the + key, you could enter the following command:

```
← [43; "plus"p
```

Now pressing + is the same as typing plus. To get the + key back you can use single key reassignment.

```
← [43;43p
```

This is actually a good way to any changes done by any of the ANSI key reassignment commands. But the most beneficial use of this ANSI command is to assign strings of text to your function keys.

DOS uses function keys F1 through F7 for various commands. But there are better things to do with those function keys.

Consider the following batch file, which reassigns text strings to the functions keys F1 through F10 (remember that list numbers are included only for reference):

```
01 : @ECHO
```

```
02 : ECHO ← 0;59;"DIR"; 13p
```



```

03 : ECHO ← [0;60; "COPY"; p
04 : ECHO ← [0;61; "DEL"; P
05 : ECHO ← [0;62; "CD "; 13P
06 : ECHO ← [0;63; "CD.."; 13P
07 : ECHO ← [0;64; CD \"; 13p
08 : ECHO ← [0;65; "WP"; 13p
09 : ECHO ← [0;66;"123"; 13p
10 : ECHO ← [0;67; "DBASE" ; 13p
11 : ECHO ← [0;68;"SCOM" ; 13p

```

Each line uses ANSI keyboard reassignment to assign a string of characters to the function keys F1 through F10. Note how the ECHO command is used to send that command to the display?

The function keys require two values for reassignment. The first is zero, the second is the scan code for the function key. F1 is scan code 60, and so on. The text string being assigned to that function key then follows the scan code. So F1 is reassigned to the string "DIR", F2 to the string COPY and so on

Note that some function Keys (lines 2, 5, 6, 7, 8, 9, 10, and 11) have their definitions followed by the value 13. That is a carriage return--the ENTER key. So pressing F4 (line9) produces "123" followed by ENTER.

ANSI.SYS COMMANDS

The following tables list all the ANSI commands by function. They're presented in the following order:

- (a) Screen commands
- (b) Cursor commands
- (c) Keyboard commands

When describing the escape sequence for each command, note that all characters listed are text character, not numbers. And there is a difference between upper and lower case. If the escape sequence requires an "H," you cannot substitute "h". Also note that the lower-case L is not a number. Note that ← represents the ESC character.

Screen Commands

The set Graphics Rendition Command is the one that changes the color of the screen. The value of *n* can be one of the following:

n Value Attribute		n Value Attribute	
0	Normal text	34	Blue foreground
1	High-intensity	36	Magenta foreground
2	Low-intensity	36	Cyan foreground
4	Underline on (mono-chrome display only)	37	White foreground
		40	Black background
5	Blinking on	41	Red background
7	Inverse video on	42	Green background
8	Invisible text	43	Yellow background
30	black foreground	44	Blue background
31	Red Foreground	45	Magenta background
32	Green background	46	Cyan background
33	Yellow background	47	white background

Fig. 12.4 Values of *n* and its attributes.

You can combine two or more attributes to create color combinations. The format is :

[*n*;*nm*

Separate all values of the variable by a semicolon and edit it with a lower-case *m*.

SUMMARY

This chapter dealt with the well-known yet little used device driver, ANSI.SYS. ANSI.SYS takes advantage of ANSI defined codes, that can be used to control your screen, manipulate the cursor, or to reassign keys on the keyboard.

n Value Attribute	n Value Attribute
0 Monochrome text 40x25	6 High-resolution graphics (two color), 640x200
1 Color text, 40x25	14 Color Graphics, 640x200
2 Monochrome text, 80x25	15 Monochrome graphics, 640x350
3 Color text, 80x25	16 Color graphics, 640x350
4 Medium-resolution graphics (for color) 320x200	17 Color graphics, 640x480
5 Same 4, but with color burst disabled	18 Color graphics, 640x480
	19 Color graphics, 320x200

Fig. 12.5 Values of n for the Set/Rest Mode Command.

ANSI Command	ESC Sequence	Description
Character Wrap On	←[=7h	Warp characters at 80 columns
Character Wrap Off	←[=7I	Do not Warp characters
Erase Display	←[2J	Clear Screen
Erase Line	←[K	Erase from the cursor's position to the end of the line
Set Graphics Renditions	←[nm	Change the foreground/background colors of the screen
Set/Reset Mode	←[nh	Change the screen resolution and graphics

Fig. 12.6 ANSI screen control commands

All ANSI codes start with an escape sequence, which presents the first problem with using ANSI codes--how to enter the ESC character into your word processor. But most word processors do allow you to insert ESCape key and you can use ANSI commands in your system prompt in batch files or in text files you type to the screen.

ANSI Command	ESC Sequence	Description
Locate Cursor	←[row,colH	Move cursor to row/coloumn
Position Cursor	←[row;colf	Move cursor to row/column
Move cursor Up	←[nA	Move cursor up n lines
Move Cursor Down	←[nB	Move cursor down n lines
Move cursor Right	←[nC	Move cursor Right n columns
Move Cursor left	←[nD	Move cursor left n columns
Save cursor position	←[s	Store the cursor's current position.
Restore Cursor Position	←[u	Restore the cursor's previously sorted position

Fig. 12.7 ANSI cursor control commands.

ANSI Command	ESC Sequence	Description
Keyboard key Reassignment	←[oldkey,newkey p	Reassign the character new key to the key board character oldkey
Keyboard String Reassignment	←[oldkey,"string"p	Assign the characters string to the key <i>oldkey</i>

Fig. 12.8 ANSI keyboard control commands.

DOS 6.2 AND ITS UTILITIES

WHAT IS NEW IN DOS 6.2

DOS 6.2 is an upgrade of DOS 6. It has added a few utilities and modified existing utilities of DOS 6. SCANDISK is the new utility that replaces CHKDSK utility of DOS 6. The utilities such as DBLSPACE, SMARTDRV, MOVE, COPY, XCOPY, DISKCOPY are modified. Following paragraphs give the details of each of these utilities.

HOW TO UPGRADE TO DOS 6.2

If you own DOS 6.0 and you want to take advantage of the new safety features of version 6.2, you can buy an inexpensive one-disk upgrade called the "MS-DOS 6.2 Step Up" and this disk installs only those files that Microsoft changed from version 6.0 to version DOS 6.2.

Insert the Step Up disk in a floppy drive and type **a:setup**. The new files are immediately copied to the DOS directory on your hard drive, and your computer automatically restarts to put the new programs and features into effect.

The one-disk upgrade is only for current users of DOS 6.0. All other DOS users must upgrade to version 6.2 by using the complete three-disk *DOS 6.2 Upgrade* package.

UPGRADATION OF DOS SHELL

Starting with version 6.2, Microsoft has moved the DOS Shell to a Supplemental Disk, which is not included in the retail Upgrade package. So, you should note that:

- (a) Your computer *will* have the *Shell* if you are using DOS 6.0 or if you have upgraded to version 6.2 from DOS 4, 5 or 6.
- (b) You *will not* have the *Shell* if you have upgraded to version 6.2 from DOS 3.3 or earlier.

- (c) You *probably will* have the Shell if your IBM PC computer came with DOS 6.2 installed on it earlier.

To see if the DOS Shell is on your computer, type: **dosshell** and then press enter key. If you see the message **Bad command or file name** the Shell is not on your computer. Check to see if the DOS disks that came with your computer include a disk labeled "Supplemental Disk." If you have that disk, you can copy all of the files to your DOS directory and then use the Shell.

Whether you are installing from scratch or simply upgrading, be careful if any of the following apply to you:

- (a) You are currently running OS/2 on your IBM PC system. You may be required to remove OS/2 first and then upgrade to DOS 6.2.
- (b) You are currently running Windows on your system. The installation procedure looks for Windows and makes certain changes to its configuration file. You will also be offered the option of installing DOS 6 backup, undelete, and anti-virus utilities for Windows or the DOS prompt, or both.
- (c) You are currently using a disk-compression system on your hard disk. If so, you can install DOS 6 but you will not be able to use the Uninstall disks. If you decide later to remove DOS 6, you will be required to restore your data from the backup you made before you started.
- (d) Your hard disk is not partitioned in a standard format. In such a case, you must refer to your documentation for special instructions. Some examples of manufacturers operating systems that employ non-standard hard disk partitions are:
 - (i) Bernoulli
 - (ii) Everex
 - (iii) Novell
 - (iv) Ontrack Disk Manager
 - (v) Prism
 - (vi) syQuest (removable hard disk)
 - (vii) UNIX
 - (viii) Vfeatures Deluxe
 - (ix) XENIX
- (e) If you find that you need to repartition your hard disk, refer to your documentation or have the job done by a qualified systems person. The DOS 6 installation documentation includes detailed information on repartitioning your hard disk. Make a backup of your data and check yourself for its reliability before preceeding.

DOS 6.2 NEW UTILITIES

In version 6.2, the CHKDSK/F command has been superseded by the new SCANDISK command, which does a more thorough job of correcting disk problems. For details, refer to the SCANDISK command. You should replace CHKDSK utility with DOS 6.2 SCANDISK utility. In addition, a new utility MSCDEX is used in DOS 6.2 to control CD ROM. Description of modified utilities of DOS 6.2 is given below.

DBLSPACE (Version 6+)

Manages compressed data disks.

SYNTAX

DBLSPACE /*switches drive*:

The first time you invoke DBLSPACE, it runs through an automatic self-configuration routine. It compresses the data on a drive that you select, usually drive C. The process takes a significant amount of time. During the process, DBLSPACE re-starts your computer twice.

Compressed data drives appear to function just like uncompressed drives; the process of handling compressed data is completely transparent to the user.

After DBLSPACE has configured itself, you can invoke the DBLSPACE command to manage certain functions of your compressed drive.

SWITCHES

drive:

/AUTOMOUNT =0

Displays information about a drive

(Version 6.2 +) Disables automatic mounting of compressed floppy drives. Because this switch modifies the DBLSPACE initialization file, you must reboot the computer for this feature to take effect.

/AUTOMOUNT = 1

(Version 6.2 +) Enables automatic mounting of specific compressed floppy drives. This is the default setting.

/AUTOMOUNT = *drives*

(Version 6.2 +) Enables automatic mounting of specific compressed floppy drives, where *drives* are the letters of the drives to be mounted. (Don't include a colon after the drive letters.) Because this switch modifies the DBLSPACE initialization file, you must reboot the computer for this feature to take effect.

/CHKDSK *drive*:

Checks a compressed disk for errors on *drive*. If no errors are found, no message is displayed. (Not available in versions 6.2 and later. Use the SCANDISK command instead.)

/CHKDSK /F *drive*:

Fixes errors on compressed *drive*. (Not available in versions 6.2 and later. Use the SCANDISK command instead.)

/COMPRESS *drive*:

Compress an existing *drive*.

/COMPRESS/NEW DRIVE = *new*:
drive:

Compress an existing drive where *new*: is a new drive letter and *drive*: is the drive letter of the existing drive.

/CONVSTAC = *stacvol*

Convert a Stacker volume where *stacvol* is the name of the stacker volume to convert.

/NEWDRIVE = *new*:

Convert a Stacker volume where *stacvol* is the name of the Stacker volume to convert, and *new*: is a new drive letter for the converted volume.

/CONVSTAC = *stacvol*

Convert a Stacker volume where *stacvol* is the name of the Stacker volume to convert and *nnn* is a new Converted Volume File number.

/CVF = *nnn*:

/CREATE *drive*:

Create a new compressed *drive*.

/CREATE/NEW DRIVE =
new: *drive*:

Create a new compressed drive where *new*: is a new drive letter and *drive* is the existing standard drive.

/CREATE/SIZE=*n.nn drive*:

Create a new compressed drive where *n.nn* is the new size and *drive* is an existing standard drive.

/DEFRAGMENT *drive*:

Rewrite files on the compressed *drive* in contiguous sectors.

/DELETE *drive*:

Delete compressed *drive*. All files are lost.

/DOUBLEGUARD = 1

(Version 6.2+) Enables background memory-checking for damaged files. DBLSPACE aborts processing when it detects damaged data. This is the default setting.

/DOUBLEGUARD = 0

(Version 6.2 +) Disables background memory-checking for damaged files. Use this switch to speed up DBLSPACE processing if you are certain that you have no damaged files. Because this switch modifies the DBLSPACE initialization file. You must reboot the computer for this feature to take effect.

/FORMAT *drive*:

Reformat compressed *drive*. All files are lost.

/INFO *drive*

Displays information about a compressed drive, where *drive* is the letter of the selected drive. (Don't include a colon after the drive letter.)

/LIST

(Version 6.2+) Lists information on all local drives, excluding network and CD-ROM drives. Lists each drive letter, its type, free space, total size, and location/name of the drive's compressed volume file (CVF). Also indicates whether safety checking and auto-mounting are enabled.

/MAP

Display the characteristics of all drives.

/MAXCOMPRESS *drive*:

Allows increased compression of *drive*.

/MOUNT =*nnn drive*

Connects a compressed volume to drive letter *drive*, where *nnn* is the number of the compressed volume file.

/MOUNT=nnn /NEW
DRIVE = *new: drive*:

/RATIO=*n.nn drive*:

/SIZE=*n.nn drive*:

/UNCOMPRESS *drive*

Connects a compressed volume to drive letter *drive*, and assigns new drive letter *new*. *nnn* is the number of the compressed volume file.

Assigns a new compression ratio to compressed *drive*.

Changes the size of *drive*, where *n.nn* is the new drive size.

(Version 6.2+) Uncompresses a DBLSPACE drive, where *drive* is the letter of the drive to uncompress. (Do not include a colon after the drive letter.) If there are no other compressed drives on your system, this switch also removes DBLSPACE.BIN from memory. Always make backups before attempting to uncompress a drive. This switch will not work if your uncompressed drive is not large enough to hold all files after uncompressing. If DBLSPACE will not uncompress your drive, delete some files.

If your host drive contains uncompressed files with the same names as files on the compressed drive, DBLSPACE will *not* uncompress the drive. Back up and *delete* the uncompressed files on the host drive before attempting to use this switch.

/UNMOUNT *drive*:

Disconnects *drive* from its compressed volume file.

Example

DBLSPACE/COMPRESS D:

changes existing disk D: to a compressed drive, using default size and compression ratio.

DBLSPACE/MOUNT =001 /A:

connects the compressed floppy drive in A: to compressed volume 001.

DBLSPACE/UNMOUNT A:

disconnects the compressed floppy drive in drive A.

Notes Changing a drive's compression ratio does not affect how files are actually compressed; instead, it affect only DBLSPACE's estimate of available disk space on compressed volumes. DBLSPACE creates a new, uncompressed drive on your hard disk. This drive is always *one letter higher* than the highest storage drive on your system (RAM disks excluded). DBLSPACE uses this drive exclusively. You should not attempt to modify the files on this drive. Most files on this drive are hidden. To see them, log onto the drive and invoke ATTRIB. Files ending in three digits are your compressed volume file, beginning with 000 for your first compressed drive and increasing after that.

DEFRAG (Version 6+)

Speeds up hard disk performance by reorganizing files.

SYNTAX

DEFRAG *drive:/switches*

As you use your hard disk, files become *fragmented*. This means that they are broken into sections and scattered in different areas of the disk. DEFRAG optimizes disk performance by arranging these fragmented files in contiguous sectors. This makes file reading faster and saves wear and tear on a disk's moving parts.

If you invoke the DEFRAG command without the *drive:* parameter, you are presented with a full screen, menu-driven system. You can select the drive you want to optimize and specify various options. You can use a mouse or the keyboard to move between various menu options. If you are using the keyboard, you can move between menu items using the arrow keys and select items by pressing the spacebar. Alternatively, you can select items by holding down the *Alt* key and pressing the keyboard key that corresponds to the highlighted character in the screen menu item.

DEFRAG includes an extensive online help system. To access online help, press F1.

Alternatively, you can select the drive and options by entering the drive

letter on the command line when you invoke DEFRAG, along with various control switches.

SWITCES

- | | |
|------------------|--|
| /F | Arranges defragmented files so that there are no empty spaces between them. |
| /U | Does not reallocate defragmented files. (Empty spaces may be left between them.) |
| /S: <i>order</i> | Sorts the files in their directories, according to the value of <i>order</i> , which can be one or more of the following characters:
N = Alphabetically by name
N - = Reverse-alphabetically by name (Z through A)
E = Alphabetically by extension
E - = Reverse-alphabetically by extension (Z through A)
D = Date /time, ascending
D - = Date/time, descending
S = Size, smallest to largest
S - = Size, largest to smallest
When you use more than one character, files are sorted first according to the leftmost characters, then characters to the right determine the order within duplicates. |
| /B | Restart the computer after defragmentation. |
| /V | Verifies that the defragmented files match the original file image in memory. |
| /SKIPHIGH | Forces DEFRAG to run from conventional memory. (Upper memory is default, if available). |
| /LCD | (Version 6.2+) Forces LCD (liquid crystal display) on laptop systems. |
| /BW | (Version 6.2+) Forces black-and-white display on systems that have trouble with DEFRAG's default display. |
| /GO | (Version 6.2+) Disables the graphic mouse and character set on nongraphic display systems. |
| /H | (Version 6.2+) Allows DEFRAG to relocate hidden files. |

Example

```
DEFRAG C:/F/S:EDS
```

defragments files and sorts them on disk so that no empty spaces fall between them, and arranges them in directories by extension, within duplicate extensions by date and time, and when date and time are the same, by size.

ERROR LEVEL CODES

- 0 = Defragmentation completed successfully
- 1 = Internal error detected while running DEFRAG
- 2 = Disk too full (No free clusters)
- 3 = Operator interrupted comparison with Ctrl-C
- 4 = General Disk failure
- 5 = Errors found reading clusters
- 6 = Errors found writing clusters
- 7 = File Allocation error (Run CHKDSK /F, or SCANDISK in version 6.2)
- 8 = Memory error
- 9 = Insufficient RAM

Notes Do not run DEFRAG on network or Interlnk drives, and do not run the program from within Windows.

If you have previously installed FASTOPEN, run DEFRAG with /B switch to reboot the computer and update file locations in memory.

|| MOVE (Version 6+)

Moves files to different locations. Can rename subdirectories. The Command may *delete* all the files.

SYNTAX

MOVE *source:\path \files(s) target: \path \file (s)*

MOVE requires that you specify the name of a source file or files. You can include a drive letter or directory path if the source file is not on the currently-logged directory. Wildcards are allowed, and will move groups of files that match the

wildcard specification.

MOVE has the same effect as copying a file to a new location and then deleting the file in the original location, in a single command. You can rename a file as you move it by specifying a new name for the file. You can specify only one file as the source if you are renaming it at the same time. If you do not specify a *target* location, DOS attempts to move the source file to the currently logged directory.

Any file in the target location that has the same name as a source file is automatically overwritten.

You can rename a directory using the MOVE command by specifying the old directory name as the source and a new directory name as the target.

SWITCHES

- /Y (Version 6.2+) Forces overwriting of existing files by files with the same name, without prompting you to confirm each overwrite. You can make this switch a default by setting the COPYCMD environment variable to equal this switch.
- /-Y (Version 6.2+) Forces DOS to prompt for confirmation before overwriting existing files with duplicate names. Use this switch if you want to be prompted to confirm overwrites and the /Y switch has been previously set as the default.

Example

```
MOVE C:\TEMP C:\NEWLOCA
```

If C:\TEMP is a file, it is moved from the root directory to the C:\NEWLOCA directory. If C:\TEMP is a directory, it is renamed C:\NEWLOCA.

Notes You cannot move a directory to a new location in the directory tree. For example, if C:\TEMP and C:\NEWLOCA were both directories, the following command would not work.

```
MOVE C:\TEMP C:\NEWLOCA\TEMP
```

However, in the above example, if C:\TEMP were a *file*, it would be moved to the C:\NEWLOCA directory.

MSCDEX (Version 6+)

Loads and enables drive letters for CD-ROM drives.

SYNTAX

MSCDEX /D: drives switches

This command is usually added to AUTOEXEC.BAT, to assign a drive letter to a CD-ROM optical reader at boot time. The CD-ROM is accompanied by its own device driver, which must be previously installed using the DEVICE or DEVICE-HIGH command in the CONFIG.SYS file. For details, consult the documentation for your CD-ROM.

SWITCH

/D: <i>device</i>	Specifies the device name of the CD-ROM driver, where <i>device</i> is the device name specified in CONFIG.SYS. For an example of how this works, refer to the Examples given below. This switch is required. When you have more than one CD-ROM. You must repeat this switch for each device driver.
/E	Allows the device driver to use expanded memory.
/S	Enables device sharing under MS-NET, or Windows for Workgroups.
/V	Displays startup statistics upon loading.
/L: <i>drive</i>	Indicates the drive letter used by the first CD-ROM, where <i>drive</i> is the letter to be used. Subsequent drive letters are assigned automatically.
/M: <i>number</i>	Specifies the number of sector buffers, where <i>number</i> is in the range X-XX.

Example

To load the driver supplied with your CD-ROM, first include an installation line in the CONFIG.SYS file, using a syntax like the following:

```
DEVICE=C:\CDROM.SYS /D: DRV001
```

In the above example, substitute your driver file for the example CDROM.SYS, and include the /D switch, substituting a driver name (either of your own choosing, or as instructed in the documentation for your CD-ROM) for example DRV001. If you have more than one CD-ROM, use a separate DEVICE command line and a unique driver name for each one.

Once the proper command has been included in CONFIG.SYS, you can execute the MSCDEX command, either in AUTOEXE.BAT or at the command prompt:

```
MSCDEX/D:DRV001/L:E
```

This command repeats the driver name specified in CONFIG.SYS, and assigns the letter E to CD-ROM. You can repeat the /D switch for each device name, and DOS will assign subsequent drive letters automatically.

Notes If necessary, use the LASTDRIVE command in CONFIG.SYS to make sufficient drive letters available for use by MSCDEX. If you have installed other options (for example, DBLSPACE) that assign drive letters, you may have to experiment with LASTDRIVE to determine which drive letter is available for your CD-ROM.

Do not execute MSCDEX from within Windows.

SCANDISK

Analyzes and repairs logical and physical disk errors. This command is available only in versions 6.2 and later. **Caution:** This command can erase or overwrite files *that have been damaged*

SYNTAX

SCANDISK *drive: switches*

SCANDISK can fix errors on commonly-used data storage devices such as hard and floppy disks, RAM drives, and DBLSPACE compressed drives. It cannot be used on pCD-ROM drives, network drives, INTERLNK drives, or drives created using ASSIGN or SUBST.

SCANDISK analyzes and repairs damage to the following:

- (a) Physical clusters
- (b) File allocation table (FAT)
- (c) Lost clusters
- (d) Cross-linked files
- (e) Directory tree
- (f) DBLSPACE volume header, file structure, compression structure and volume signature
- (g) MS-DOS boot sector

The *drive* parameter indicates the drive to be scanned, where *drive* is the letter of the disk drive. If you wish to scan more than one drive, you can repeat this parameter for each one. If you omit the parameter, SCANDISK works on the current drive.

You can also use SCANDISK to check an unmounted DBLSPACE compressed volume file for errors. To do so, use the volume file name (for example, H:\DBLASPACE.000) in place of the *drive* parameter. To unmount a compressed hard disk boot drive, press Ctrl-F5 or Ctrl-F8 when you see the message, "Starting MS-DOS" at boot time. If you are checking an unmounted hard disk boot drive, have a copy of SCANDISK.EXE available on a floppy.

SWITCHES

/ALL	Checks and repairs all nonnetwork drives.
/AUTOFIX	Suppresses prompts to fix errors. Do not use this switch with the /CHECKONLY or /CUSTOM switches.
/CHECKONLY	Scans but does not fix errors. Do not use this switch with the /AUTOFIX or /CUSTOM switches.
/CUSTOM	Processes using special configuration instructions found in the SCANDISK.INI file. For details on SCANDISK.INI, refer to the Notes section below. Do not use this switch with /AUTOFIX or /CHECKONLY switches.
/MONO	Forces monochrome display on systems that cannot use SCANDISK's default display.

/NOSAFE	Forces deletion of lost clusters. The default setting saves lost clusters in files on the root directory.
/NOSUMMARY	Suppresses display of statistical summary at the conclusion of scan and repair.
/SURFACE	Performs a surface scan, seeking bad clusters on the physical surface of the disk, without prompting. The default setting will prompt before performing a surface scan.
/UNDO <i>drive</i> :	Restores a disk to its previous state, using the special "Undo disk" that you were prompted to create during the repair process. The <i>drive</i> parameter indicates the letter of the drive containing the "Undo disk".

Examples

SCANDISK C:

scans and repairs errors on drive C.

SCANDISK C: /NOSAVE /SURFACE

scans and repairs errors on drive C, automatically deletes any lost clusters, and automatically begins a surface scan (seeking bad clusters) after scanning for logical errors.

ERROR LEVEL CODES

0	=	No problems found
1	=	Incorrect command syntax
2	=	Process aborted because of an out-of-memory or other internal error
3	=	Premature exit from logical check requested by operator
4	=	Premature exit from surface scan requested by operator
254	=	All problems corrected
255	=	Some problems were not corrected

Notes When SCANDISK finds an error, it displays a dialog box offering you the option to fix, ignore, or display more information on the problem. Use the Tab key to highlight the desired option and press Enter, or use the mouse pointer to pick the desired option. SCANDISK offers you the opportunity to create an "Undo Disk" which can be used to restore the scanned disk to

its prescanned state. This insurance feature is limited, however, because you can restore a disk only if you haven't made any changes to it after the errors were repaired. Configuration information for SCANDISK is contained in a special ASCII file called SCANDISK.INI. This file provides default settings for options that control SCANDISK's behavior. For details, refer to SCANDISK.INI, which is readable and modifiable in a text editor such as DOS's EDIT. SCANDISK.INI options are:

DISPLAY	Options are AUTO (the currently configured display), MONO (monochrome), COLOR (color), and OFF (no display). The default option is AUTO.
MOUSE	Enables mouse driver. The default is ON (use mouse driver). The other option is OFF (do not use mouse driver).
SCANTIMEOUT	Enables detection of disk timeout states during scan. The default setting is ON (detect disk timeouts). The other option is OFF (ignore disk timeouts).
NUMPASSES	Determines the number of reads per data cluster during scan. The default is 1. Valid range is from 1 to 65,535.
LABELCHECK	Disables checking of volume labels for invalid character. The default setting is OFF (disable label checking). The other option is ON (enable label checking)

The following options are valid only when SCANDISK is invoked with the /CUSTOM switch:

DRIVESUMMARY	Displays summary information after checking each drive. The default is AUTO (summary only when errors are found). Other options are ON (always display summary) and OFF (never display summary).
ALLSUMMARY	Displays summary information after checking all drives. The default is AUTO (summary only when errors are found). Other options are ON (always display summary) and OFF (never display summary).
SURFACE	Disables surface scanning of physical disk sectors. The default is NEVER (disable surface scan). Other options are ALWAYS (enable surface scan) and PROMPT (ask user to confirm surface scan). Overridden by the /SURFACE command-line switch.

CHECKHOST	Disables checking of the host drive before checking compressed drive. The default is NEVER (disable host checking). Other options are ALWAYS (enable host checking) and PROMPT (ask user to confirm host checking).
SAVELOG	Manages a repair log file on disk. The default is OFF (do not create file). Other options are APPEND (add to existing file) and OVERWRITE (overwrite existing file).
UNDO	Disables creation of an "Undo disk". The default is NEVER (do not create disk). The other option is PROMPT (ask user to confirm creation of "Undo disk").

The following settings are used to control the types of errors SCANDISK will correct. They also require the /CUSTOM switch. They all use the same options:

FIX	Always fix the error.
PROMPT	Prompt before fixing the error.
QUIT	Abort processing when the error is found.

The default option is always PROMPT. The settings are:

DS_HEADER	Damaged compressed volume file (CVF) header
FAT_MEDIA	Corrupt or missing file allocation table (FAT)
OKAY_ENTRIES	Damaged directories or files.
BAD_CHAIN	Truncated directories or files
CROSSLINKS	Cross-linked files

The following settings use the options described above, but have an additional option, SKIP, which causes SCANDISK to bypass the error but continue processing:

BOOT_SECTOR	Damaged compressed boot sector
INVALID_MDFAT	Damaged compressed file allocation table entries
DS_CROSSLINKS	Cross-linked compressed files
DS_LOSTCLUST	Lost compressed clusters
DS_SIGNATURES	Missing compressed volume signatures
MISMATCH_FAT	Corrupt file allocation table on noncompressed drives
BAD_CLUSTERS	Corrupt or unreadable physical data clusters

The following miscellaneous settings use options as described to respond to the errors they represent:

BAD_ENTRIES	Irreparably damaged directories or files. The default option is PROMPT (ask to confirm before deleting entry). Other options are DELETE (always delete entry) and QUIT (abort processing when error is encountered).
LOST_CLUST	Uncompressed lost clusters. The default option is PROMPT (ask user to confirm before fixing). Other options are SAVE (save lost clusters to files), DELETE (delete lost clusters), QUIT (abort processing when lost clusters are found), and SKIP (ignore lost clusters and continue scan).

COPY

Making Copies of Files or Combining Files

SYNTAX

```
COPY [/A | /B] source [/A | /B]
[+ source [/A | /B] [+...]]
[destination [/A | /B]] [/V] [Y | -Y]
```

COPY is a command that places duplicates of one or more files at the new location you specify. You can name new files with the same file names as the originals or specify different names. You can also use COPY to combine (*concatenate*) files. The parameters used here are explained below:

<i>source</i>	Tells DOS the location and name of a file or set of files you want to copy. There is no need to include a disk name if the source file is on the active disk.
<i>destination</i>	Specifies the desired location and (optionally) name of a file or set of files. There's no need to include a disk name if the destination subdirectory is on the active disk.

SWITCHES

/A and /B switches are used when specifying source and /or destination files. The switches tell DOS what to do when copying ASCII (text) or Binary (program) files. For instance, they tell DOS how to treat End of File (EOF) characters.

There are two new switches for COPY in DOS 6.2. /Y will turn off overwrite prompting. /-Y will turn it on.

Examples

Copying files with the DOS COPY command requires attention to detail, and at least one *skilled* typing finger. And you need to remember the exact name and extension of the file being copied. That's why many people prefer the Shell or Windows.

In some situations--using the COPY command to copy a file from the root directory of one disk to the root of another, for instance--you *can* leave out some of the detail if you know what you're doing. And you can use wildcards to copy multiple files at once if they have similar names. But in general DOS needs to be told:

- (a) The source drive's name (C:, for instance)
- (b) The subdirectory's name (BATCH, for instance)
- (c) The destination drive's name (B: perhaps)
- (d) The destination subdirectory
- (e) The name of the file or files being copied (1.BAT, or *.BAT, for example)

Suppose you want to copy a file named AUTOEXEC.BAT from your C: drive to a floppy in the A: drive. Here's one way to do that with the COPY command:

1. Make sure the destination disk (A: in this example) is ready and has enough free space for the file being copied.
2. Type **COPY** and a space.
3. Type the filename and path of the source file (in this example, C: \AUTOEXEC.BAT)
4. Type another space.
5. Type the destination drive name (A: for instance) and an optional path if you want the file to be copied into a directory other than the root directory of the destination drive. Then press ENTER key.

Notes In the previous example, you can leave out the C:\ portion of the command, if you are already "logged on" to the C: drive's root directory. The actual location of source and destination files, and the current directory determine how much path detail is required. For instance, to copy from your hard disk to a floppy might be accomplished with the command:

```
COPY C: \DOS \README.TXT B:
```

Or, if the DOS subdirectory on drive C: is the current directory, this simplified command might work:

```
COPY README.TXT B:
```

To rename a file while copying (for example, README.TXT to README.NOW), specify a new destination *filename*:

```
COPY README.TXT B:README. NOW
```

To combine (join) two or more files into one, specify the individual file names in the command line separated by plus (+) signs. For instance, to join CHPTR1 and CHPTR2 and CHPTR3 (from the root of C:) into a new file called SECT1 in the root of drive B:, you might type:

```
COPY C:\ CHPTR1+ CHPTR2+ CHPTR3 B:\SECT1
```

You can use wildcards while copying. For example:

```
COPY C:\DOS\*. TXT B:
```

will copy all files in the DOS subdirectory that end with the extension TXT to drive B:

NEW IN DOS 6.2

The behavior of the COPY command has changed a little for DOS 6.2. By default , when you try to copy over another file, you will be asked for permission to overwrite the original. At the prompt you can answer **Y to overwrite**, **N** to skip, or **A** to overwrite everything and disable prompting. The command switch /Y disables prompting. The command switch /- Y explicitly enables overwrite prompting.

SMARTDRV

SMARTDRV starts or configures a program that creates a disk cache in extended memory. The cache significantly speeds up certain disk operations. Normally, SMARTDrive is loaded by adding a SMARTDRV command to your AUTOEXEC.BAT file. It can also be run at the command prompt.

NEW IN DOS 6.2

Some aspects of SMARTDRV have changed in DOS 6.2. The default setup for SMARTDRV is safer than in previous versions. Write caching is disabled, and the cache will be written out to disk before the computer will return you to a command prompt. Another good thing: SMARTDRV will now cache CD-ROM drives.

XCOPY

XCOPY is a powerful command that duplicates directories, their subdirectories, and files (except hidden and system files).

NEW IN DOS 6.2

DOS 6.2 has two new switches for XCOPY. /Y will turn on overwrite prompting. /-Y will turn it off.

SWITCHES

Here are XCOPY's switches:

- | | |
|---------|---|
| /A | copies only source files that have their archive file attributes set, without modifying the archive attribute. |
| /M | copies source files that have their archive file attributes set and turns off archive file attributes as it goes. |
| /D:date | copies only source files modified on or after the specified date. |
| /P | prompts you to confirm whether you want to create each new file. |

/S	copies all directories and subdirectories, unless they are empty. If you omit this switch, XCOPY works within a single directory.
/E	copies any subdirectories, even if they are empty. /E can only be used along with the /S switch.
/V	verifies that source and destination files are identical
/W	displays a "Press any key" message and waits for you to prepare the disk (s).
/Y	turns on overwrite prompting.
/-Y	turns off overwrite prompting.

NEW IN DOS 6.2

In DOS 6.2, XCOPY has changed in the same way as the COPY and MOVE command. When you try to use XCOPY to overwrite another file of the same name, you will be prompted for permission to continue. At the prompt, you can answer **Y** to overwrite, **N** to skip, or **A** to overwrite and disable prompting. The /Y switch disables prompting. The /-Y switch explicitly enables overwrite prompting. You can change XCOPY's default behavior by using the COPYCMD variable.

NETWORKING USING DOS 6 & 6.2

LINKING COMPUTERS BY CABLE

DOS 6.2 include two programs, named INTERLNK and INTERSVR, that let you connect two computers without expensive networking equipment. Once you've connected them via cable, you can easily move or copy files from one computer to the other, without using floppies. These programs are particularly handy when you want to transfer files between a PC/AT and a PC computer.

CLIENT AND SERVER

When you link two computers with INTERLNK, the computer you use to type commands is called the *client*. The computer connected to the client is the *server*. It does not matter, however, which computer is which. If one of the two computers has a better keyboard, use that one as the client.

INTERLNK HARDWARE REQUIREMENTS

You need a cable to connect the two computers. You can use either the parallel printer ports or the serial ports of the two computers. For a parallel connection, you need a bidirectional parallel cable. For a serial connection, you need either a 3-wire serial cable or a 7-wire null-modem serial cable.

Be sure to connect the two computers before activating the INTERLNK and INTERSVR software. Otherwise, the software cannot recognize the connection.

You'll also need 16K of free memory on the client computer and 130K of free memory on the server. Both computers must be running MS-DOS 3.0 or later.

INTERLNK SOFTWARE REQUIREMENTS

It's not necessary for both computers to use DOS 6. However, the client computer must have INTERLNK.EXE on disk and the server computer must have

INTERSVR.EXE. But there's no harm in having both programs on both computes. Both INTERLNK.EXE and INTERSVR.EXE are copied to the \DOS directory when you install DOS 6.

What If One Computer has No Floppy?

Some computers, including palmtops, have no floppy disk. Fortunately, you can still copy INTERLNK.EXE and INTERSVR.EXE from any computer that has those files installed to floppy-less machine. In the steps below, the floppy-less machine you're copying to is the *remote* computer.

The MODE command must be available on the remote computer.

- (a) Use a 7-wire null-modem serial cable to connect the computers. (a 3-wire serial cable or parallel cable won't work).
- (b) Disable SHARE.EXE on the remote computer. If that computer's AUTOEXEC.BAT file loads SHARE.EXE, use EDIT to remove the line or convert it to a comment. To convert a line to comment, type *REM* followed by a space at the beginning of the line. Save your changes and reboot the remote computer.
- (c) On the computer you're copying from, type:

```
intersvr / rcopy
```

at the command prompt.
- (d) Follow the instructions on the screen to copy the files INTERSVR.EXE and INTERLNK.EXE to the remote computer.

Making the Connection

When the cable is in place, and each computer has the appropriate programs available, here's how you make the connection (note that you only need to perform steps (a)–(d) above once, not each time you wish to make a connection):

1. Start at the DOS command prompt on the client computer. Use EDIT to open the C:\CONFIG.SYS file.
2. Add the command **device =c:\dos\interlnk.exe**, on its own line, near the end of CONFIG.SYS. Optionally, if you want to choose whether to turn INTERLNK on or off each time you start your computer, put a question mark (?) in front of the equal sign like this:

```
device?=c:\dos\interlnk.exe
```
3. Exit the editor and choose Yes to save your changes. You'll return to the DOS command prompt.

4. Reboot the client machine (press Ctrl+Alt+Del). You may notice a message indicating that no connection was made. Don't worry about that.
5. Go over to the server computer's keyboard, and enter the command **intersvr**.
6. Now go back to the client computer, and enter the command **interlnk**.

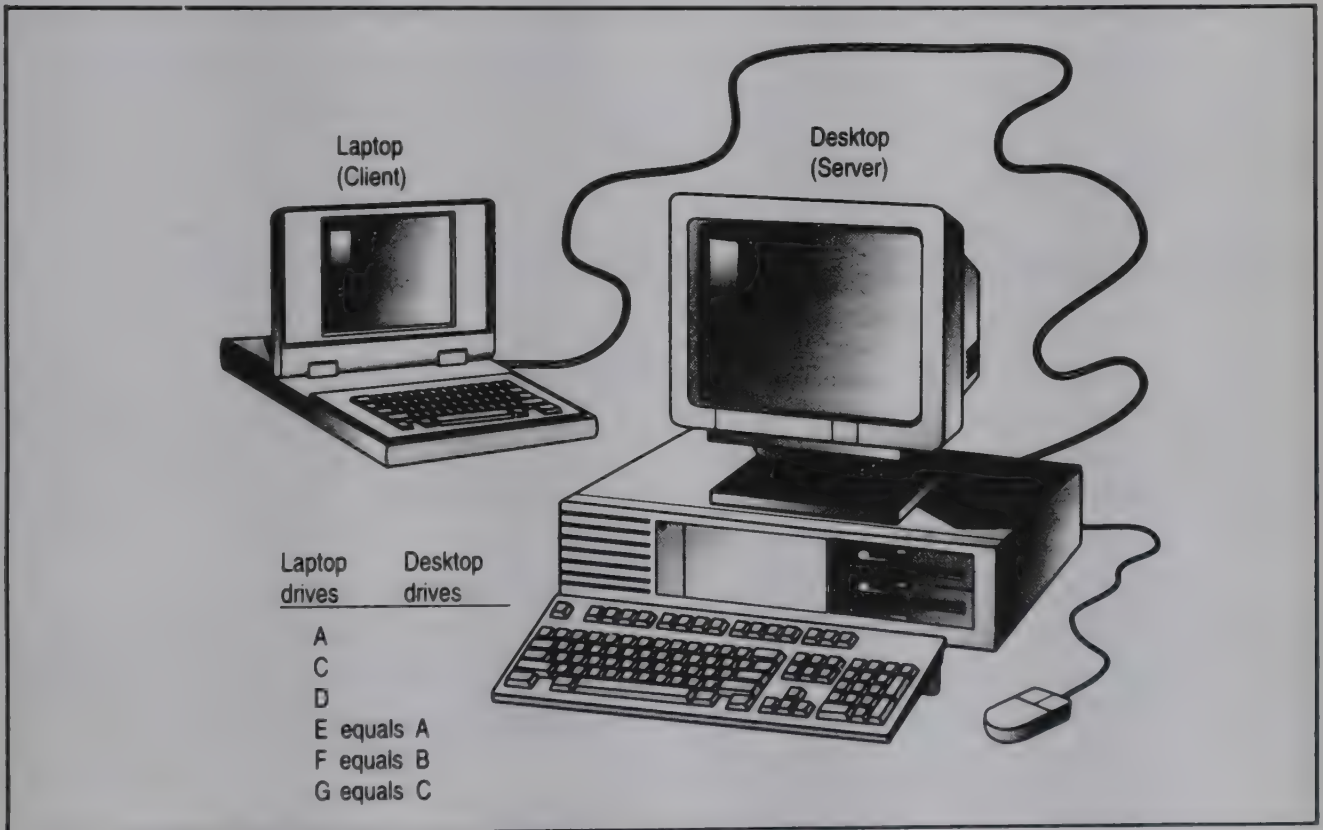


Fig. 14.1. Redirecting of each computer's drive

In the above figure, You'll see drive E of the laptop computer (client) represents drive A of the desktop.

Example

Enter the command **tree k:** to view the directory tree of drive C on the server computer.

Enter the command **copy k:\mydirec*.*** to copy all the files from C:\MY-DIREC of the server computer to the current drive and directory of the client computer.

Enter `copy c:\mydirec\*. *k:\mydirec\*. *` to copy all the files from the C:\MYDIREC directory of the current (client) computer to the C:\MYDIREC directory of the other (server) computer.

Enter `echo ^L >Lpt2:` (where you press Ctrl+L to type ^L) to eject a page from the printer attached to LPT1 on the server computer.

You can even go in to the DOS Shell and copy and move files between computers with simple dragging.

Just remember that all the drive letters on the server computer are "larger" now. For example, drive A on the server will now be treated as drive I (or whatever). Just look to the server's screen, or enter the command **interlnk** at the command prompt on the client computer, when you need a reminder about which drive letter is which.

Accessing More than Three Server Drives

You probably noticed that Figure 1 showed only three drives--A, B, and C--available on the server. By default, INTERLNK.EXE allows the client computer to use only three server drives. However, you can easily increase the number of drives available. To do this, add the /DRIVES switch to the DEVICE= line in CONFIG.SYS. The general form of this switch is /DRIVES:n (where n is the number of drives the client computer can use on the server).

Suppose your server has two floppy drives (A and B) and two hard drives (C and D). The simple DEVICE=command shown earlier will let you use drives A, B and C on the server, but *not* drive D. To solve this problem, open the client computer's CONFIG.SYS file in the Editor. Now add the /DRIVES switch to the DEVICE=command for INTERLNK, like this:

```
device=c: \dos\interlnk.exe /drives:4
```

The /DRIVES switch in this example will let the client access four drives on the server. Now, exit the Editor, save your changes, and reboot the client computer. The next time you use **interlnk** at the command prompt, you'll see the additional server drive included in the list of available drives.

Commands to Avoid During a Link

The following DOS commands don't work with INTERLNK:

- (a) CHKDSK
- (b) DEFRAG
- (c) DISKCOMP
- (d) DISKCOPY

- (e) FDISK
- (f) FORMAT
- (g) MIRROR
- (h) SCANDISK
- (i) SYS
- (j) UNDELETE and
- (k) UNFORMAT

You should also avoid task swapping in the Shell (and Windows) while you're in an INTERLNK connection.

Breaking the Connection

To break the INTERLNK connection between computers, press Alt+F4 on the server's keyboard. To restart the server, type **intersvr** at the server's command prompt.

TROUBLESHOOTING

If you have a problem, first make sure that the computers are connected correctly and you've started the server. If you're OK there, make sure the **LASTDRIVE=command** in each computer's **CONFIG.SYS** file is set high enough to accommodate all the drive names. For example, if each computer has four drives, A through D, then you need to have eight drive names available, A, B, C, D, E, F, G, and H. Thus, the appropriate command in each computer's **CONFIG.SYS** file would be

```
lastdrive=h
```

There is no harm in using the command **lastdrive=n** rather than **lastdrive=h** in **CONFIG.SYS**. And don't forget that after changing and saving the **CONFIG.SYS** file, you still need to reboot to activate the new **LASTDRIVE** command.

If you aren't using a network, simply omit the **LASTDRIVE** command. DOS will set the default **LASTDRIVE** value to the letter following the last one in use.

You shouldn't change or delete the **LASTDRIVE** command when the client computer is connected to a Novell network. That's because Novell network drives start with the letter *after* the drive specified by **LASTDRIVE**. Different **LASTDRIVE** settings might cause problems with batch programs and other commands that rely on a particular drive letter. Moreover, a **LASTDRIVE** that's too high may prevent you from using your network drives at all.

Server Drives are not Ready

If you try to access a drive on the server computer from the Shell or Windows File Manager, and DOS reports a "Not ready" error on that drive, chances are you've just forgotten to run INTERSVR. Go to the server computer's keyboard and enter the command **intersvr** so that you see the INTERSVR screen. Then go back over to the client computer's keyboard and try again. If the server's floppy drive is "Not ready," make sure that it contains a properly inserted disk.

For More Info

For more information on INTERLNK, INTERSVR, optional parameters and switches, and cabling, enter **help inerlnk** or **help interlnk.exe** or **help intersvr** at the DOS command prompt.

LINKING YOUR PC TO A MACINTOSH

InterLnk solves the problem of laptop connectivity to PCs, but what about the several million Macintoshes you may run into? Fortunately, there are a variety of solutions for Macintosh connectivity:

- (a) Interplatform Sneakernet using Super Drive floppies
- (b) Running PC software on the Macintosh
- (c) Direct serial connections between Mac and PC
- (d) Networking Macs and PCs together
- (e) File transfer/translation programs

Interplatform Sneakernet using Super Drive Floppies

All Macintoshes produced since 1990 come with the Super Drive, a 3 1/2-inch high-density floppy that can read DOS 720 KByte and 1.44MByte disks. So if Sneakernet had been a possible option for pure DOS transfer, it can be made to work between platforms as well.

Macintoshes that come with a Super Drive include

- (a) The Macintosh IIx, IICx, IIsi, IIci, IIfx
- (b) All Macintosh Quadras
- (c) All Macintosh Power book notebook computers except the Powerbook 100, which comes with no disk drive
- (d) All Macintosh Classics
- (e) All Macintosh LC models
- (f) All Macintosh Performa models

(g) Many SE/ 30s and SEs

This often means the simplest (and cheapest) solution for transferring smaller files is to plug the disk in a Macintosh drive.

You'll need to run a special utility called Apple File Exchange, which comes with the Macintosh operating system. Look in the Macintosh's System folder, or if it isn't there, use the Find File utility to locate it. In System 6, Find File is in the menu under the apple. In System 7, the equivalent Find command is in the menu under File.

When you've found Apple File Exchange, double-click on it to open it. The contents of your Macintosh's current drive should appear in the left-hand window. The right-hand window should be blank. Now, insert your 3 1/2-inch MS-DOS floppy. Its contents will appear in the box at the right. The menu bar option Mac-to-PC now becomes active.

Click on the file to be moved. Check under Mac-to-PC to see whether or not there is a built-in translator that can help you translate your PC data formats into a Macintosh equivalent. Click on Translate, and the file is moved.

Running PC Software on the Macintosh

You can run PC Software on a Macintosh using a family of programs called SoftPC and more recently, SoftPC Professional, both published by Insignia Solution.

With SoftPC, your Macintosh SuperDrive acts as a PC drive, and you set up a Macintosh file that behaves as a DOS partition.

SoftPC mimicks DOS 3.3, SoftPC Professional upgrades to DOS 5. One variant even runs Microsoft Windows-though you need a top-of-the-line Mac Quadra to do it.

If you already own a PC, you can run it remotely (and faster) from your Macintosh using RunPC (Argosy Software). A TSR sits in memory on the PC, waiting to be called by RunPC through either a serial Port connection or a modem. This makes RunPC a solution for controlling your office Macintosh from your home PC, or vice versa.

Yet another option is installing a real PC in your Macintosh II's "NuBus" expansion slot. Orange Micro offers the Mac 86, Mac286, and Mac386. The Mac386 even enables you to add two standard PC boards to it, if you have the room-some Mac IIs don't. Unfortunately, these boards are often more expensive than purchasing an equivalent MS-DOS computer and RunPC to connect it.

Serial Connections between the Mac and PC

You always can run a null-modem cable between your Macintosh and your PC and upload files through communications software.

A null modem cable is similar to an ordinary serial cable, except that it crosses two pins, fooling both serial ports into thinking they're connected by a modem. Most communications software support null-modem direct connections.

However, you'll need a cable that will connect the Mac's nonstandard round mini-DIN-8 RS-422 serial connector, shown in Table 1, with your PC's 9-pin (DB9) or 25-pin (DB25) serial port).

Very old Macintoshes, including the Macintosh 128K, 512K, 512Ke, use a different nonstandard 9-pin serial connector, the DIN-9. Table 1 lists the pin outs for Macintosh serial ports and can be used to build compatible cables.

Table 1 Macintosh Serial Port Pinouts

	Macintosh 128K, 512K, 512Ke (9-Pin)	Macintosh Plus (Most 8-pin, Some 9-Pin)	Macintosh SE and All Macintoshes (8-Pin)
Data carrier detect	None	None	Pin 7
Clock input	None	None	Pin 7
Data terminal ready	None	Pin 1	Pin 1
Clear to send	Pin 7	Pin 2	Pin 2
Receive data (RxD+)	Pin 8	Pin 8	Pin 8
Receive data (RxD-)	Pin 9	Pin 5	Pin 5

Table 2 Macintosh Serial Port Pinouts

	Macintosh 128K, 512K, 512Ke (9-Pin)	Macintosh Plus (Most 8-pin, Some 9-Pin)	Macintosh SE and All Macintoshes (8-Pin)
Transmit data (TxD+)	Pin 4	Pin 6	Pin 6
Transmit data (TxD-)	Pin 5	Pin 3	Pin 3
Signal ground	Pin 3	Pin 4	Pin 4
Chassis ground	Pin 1	Shell	Shell
+5V power	Pin 2	None	None
+12V power	Pin 6	None	None

While connecting, you must ensure the following:

- (a) Make sure both cables are firmly in place (but don't force them-if you have to, you might have the wrong cable).
- (b) The printer and phone icons in your software and on the back of your Macintosh are both serial ports-make sure you choose the same port in software that you have physically connected.
- (c) Set both computers to the same parameters, including baud rate, data bits, stop bits, and parity.
- (d) Set both computers to direct connect.
- (e) Set one computer to Originate, and the other to Answer.
- (f) "Dial" from the originating computer.
- (g) When connected, make sure both computers are using the same file transfer protocols.
- (h) Set the sending computer to Upload and the receiving computer to Download.
- (i) Send the file.

NETWORKING MACS AND PCS TOGETHER

If you already have a Novell NetWare network, your Macintosh can be added to it using Net Ware for Macintosh. Alternatively, you can build a small TOPS network-say one Macintosh, one PC, and one LaserWriter. This requires adding an Apple Talk-compatible card, such as Sitka's FlashCard to your PC, purchasing Mac TOPS and DOS Tops software, and connecting everything with twisted-pair phone wiring and Fadsrallon Phone Net (or compatible) connectors.

File Translation

If all you've to do is to move your raw data onto the Macintosh's hard drive, chances are-unless it's pure ASCII-your data will have formatting that won't be recognizable to the Macintosh application you plan to use it with. Use applications that come in versions for both the Macintosh and the PC Use file transfer programs that also handle translation.

Sibling Applications

If you plan to work extensively across platforms, seriously consider using software that runs on both platforms, for example:

- (a) Microsoft Word, WordPerfect, Word 6 for Windows (word processing)

- (b) Aldus PageMaker, QuarkXpress, FrameMaker (desk top publishing)
- (c) Microsoft Excel, Lotus 1-2-3 (spreadsheet)
- (d) Claris Filemaker Pro (flat-file database)
- (e) Adobe Illustrator, Aldus Freehand (illustration)
- (f) Adobe Photoshop (photo retouching)
- (g) Aldus Persuasion, Microsoft Powerpoint (presentations)

Some of these programs recognize that you are trying to load a DOS file and ask you if you want to convert it. In any case, most of these applications include conversion utilities that enable you to convert the files into a form readable by their sister programs.

If possible, standardize on the same generation of program on both platforms. Windows Excel 4.0 files, for example, contain formatting that Macintosh Excel 3.1 hasn't learned about yet.

Even within a generation, conversion utilities aren't always perfect- you may still find you have some cleaning up to do. But they will get you most of the way there. Common translation problems include the following:

- (a) Changes in colors
- (b) Inability to read macros and style
- (c) Inability to view graphics
- (d) Shifts in text

Font Substitution

One especially common problem is font substitution. The Windows TrueType font Times New Roman, for example, corresponds to the Macintosh font Times, but they aren't exactly alike.

In particular, the spacing between letters varies. So you may think you've set up a page to fit perfectly, and then you find that it's jumped to the next page when you switch platforms. This is especially annoying in desktop publishing.

The best solution available (and this is not always possible or perfect) is to use the same fonts on both platforms. That means fonts from the same manufacturer, that is, Adobe, Bitstream, or Monotype-not simply fonts with similar names.

Graphics Formats

The Macintosh and PC each support a plethora of graphics standards, but only a few are used on both platforms. Generally, the easiest files to convert are encapsulated PostScript and TIFF files. If you can't use only TIFF and EPS files,

programs Paintshop Pro and Hlaak (Inset Systems specialize in converting among DOS graphics formats. There are DOS and Windows versions.

Because TIFF and EPS files can be large, you may want to compress them: programs that compress and decompress ARC and ZIP; formats are available on both platforms.

MS-DOS 6.2's DBLSPACE and the popular program Stacker are not compatible with Stuffit (Aladdin Systems), the most widely used Macintosh compression program. Stuffit Deluxe, however, can decompress ARC and ZIP files.

The following list shows some standards, graphics and otherwise, that are reasonably well-supported on both platforms: Macintosh and PC.

a)	Graphics	TIFF and EPS
b)	Text	Rich Text Format (Microsoft)
c)	Database	DBF (dbase)
d)	Spreadsheet	WK1 (Lotus)
e)	Compression	ARC, ZIP

Compatible File Names

you know a file that will need to be translated, use a file name that will be understood on the other end. This is mostly a problem in going from Mac to PC. Mac file names can be up to 31 characters and may include characters that aren't allowed in DOS file names. In translation, your file names may be truncated in ways you won't recognize and may not include an appropriate extension.

Translation and File Transfer Programs

Already mentioned, Apple File Exchange includes limited file translation options. If you need more-and if your sibling programs can't handle the job-consider MacLinkPlus (Dataviz), LapLink/Mac III (Traveling Software, or Software Bridge (Argosy Software).

MacLinkPlus is available in two versions. MacLinkPlus/PC 7 comes with files and file transfer software for both PCs and Macs. MacLinkPlus/Translation 7 assumes your data is on disk and includes Dayna's DOS Mounter Software to help the Macintosh recognize it.

Both versions contain more than 700 translations, the widest translation available-even containing selected translations to Sun and Next workstations. Some of the translations aren't as robust as those provided by the programs themselves, but if you need the job done, MacLinkPlus is invaluable.

Another option, stronger on file transfer and somewhat lighter on translation, is LapLink Mac III.

MacLinkPlus becomes even more valuable when you use it with XTND-compatible applications. These applications use a new Claris technology, XTND, that automatically connects a file with the appropriate translation resource when you open the file.

LapLink/Mac III contains fewer translators but, quite possibly, the best cross-platform file transfer software available. With LapLink/ Mac III, you get Macintosh and PC file transfer software, a cable that supports serial connections at both ends, and a modest set of file translators. Unlike some PC file transfer software, LapLink/Mac (and its sibling, LapLink III) also can work with modems. It also works with AppleTalk networks, which can themselves support PCs.

Software Bridge specializes in text documents. With Software Bridge running, you can double-click on a DOS text document; Software Bridge identifies and translates it, and loads it into the correct Macintosh word processing program, with much of the formatting intact.

Link MacLinkPlus/Translators, Software Bridge comes with a utility for helping the Macintosh automatically recognize DOS disks without fooling around with APPLE File Exchange.

VIRUS AND ITS ANTIDOTE IN DOS 6 & 6.2

WHAT IS VIRUS ?

A *computer virus* is a small program that attaches to other programs and holds in them. Viruses thus require "hosts" and are never standalone programs. All viruses replicate, making additional copies of themselves.

WHAT IS WORM ?

A *worm* is a program that does not hide in other programs, but is selfsufficient, stand-alone code. Worms, like viruses, make additional copies of themselves.

WHAT IS TROJAN HORSE ?

A *Trojan horse* is a stand-alone program like a worm. Unlike either a virus or a worm, it does not make copies of itself.

WHAT IS JOKE PROGRAM ?

A *joke program* is any code that might simulate the effects of a virus, but does not replicate or cause damage.

WHAT IS A DROPPER ?

A *dropper* is any program that contains a virus and is intended to release the virus when the dropper itself is run. The dropper usually contains the virus in encrypted form so that your scanner does not find any problem with it when it is scanned.

Viruses, worms, and Trojans, can damage your data, although this is not always the case.

TYPES OF VIRUSES

Viruses can be classified by whether they infect files or the boot areas of disks. If a virus infects files, it may damage only COM files or both COM and EXE files. Some viruses also infect SYS, BIN, OVL, and other file types. A few add their codes to both files and boot sectors.

All boot viruses and about 60 percent of file viruses become memory resident. When a virus attaches to one of your programs, it generally attaches in such a way that its code executes before your program does. A few viruses overwrite your programs when they infect them. When a program is overwritten, part or all of its original code is replaced by the virus's code.

Viruses try to be sneaky, and some incorporate ingenious means of escaping your watchful eye. A *polymorphic virus* is one that can take dozens or hundreds of different forms. Polymorphic viruses are more difficult to detect with anti-virus software, because they can't be caught by matching scan strings.

A *stealth virus* is one that escapes some method of detection. When Frodo, for example, is in memory, you won't see that it has added any bytes to any of your files. You won't find it in any file containing it if all you do is use the TYPE command. And you won't see it listed as a TSR when you run MEM.

WHERE VIRUSES COME FROM ?

Virus authors are more abundant in Asia, Africa, South America, and Eastern Europe where there are few copyright laws. Table 1 shows countries producing 10 or more viruses.

Table 1 Tallies by Country of Origin

Country	Number of Viruses
Bulgaria	97
Germany	40
Indonesia	14
Israel	16
Poland	15
Taiwan	18
The Netherlands	13
USA	32
USSR	56

WHO WRITES VIRUSES ?

Most authors are high school or college students. Most are accomplished programmers in assembly language and perhaps other languages.

Table 2 Virus Damage Amount

<i>Damage Amount</i>	<i>Number of Viruses</i>
None	6
Insignificant	191
Minor	423
Substantial	383

Although most viruses don't cause much damage, most users attempting to remove a virus can cause a great deal of damage. Doing a low-level format of your hard disk is not the best method of removing a file virus, although it is effective! But such efforts will cause more harm than good.

What Kind of Damage Can Viruses Cause?

Some viruses (such as Jerusalem) delete your programs as you try to run them on some special day, such as Friday the 13th. Some (such as Michelangelo) overwrite some or all of your hard disk, given the right circumstances. Others (such as the dBASE virus) may make subtle changes in your databases. Other viruses may produce the same symptoms as hardware problems. But, none damage hardware.

How Serious Is the Virus Threat?

Your exact probability of being infected is a function of two factors: the number of viruses appearing at your door, and the measures you have taken for preventing their entry through that door. The number of viruses "at the door" is determined by the frequency with which new software is brought into your organization (by disk or modem) and the increasing probability that this software is infected. The measures in place are established by policy and procedures.

PREVENTING VIRUSES

Preventing viruses seems to be difficult when you consider how simple it is to get one. To get a boot virus, simply put an infected disk in drive A and turn your computer on or press Ctrl+Alt+Del. To get a file virus, simply copy an infected

file or run it.

Following is a list of some helpful things you can do to reduce the chances that your machine will be infected by a virus.

- (a) Don't boot computers from floppy disks that have been in any other computer. Always open the drive 'A' door immediately after using a floppy disk, and always check to see that the drive 'A' door is open before turning on the machine.
- (b) If the system is to boot from a floppy disk, make sure that the boot floppy disk is labeled to identify the machine it belongs to, and enforce a policy that restricts the use of that floppy disk to that machine only.
- (c) Consider creating a virus scanning machine for employee use. The ideal machine contains a menu-driven product that can scan a floppy disk in drive A or B with the press of a key. All employees could be required to scan all disks they bring from home before taking them to their office.
- (d) Any software lending library, shared computer, or training room is a potential virus transmission site. At even greater risk is the friend who may visit a user experiencing difficulties, get a virus on their diagnostic disk, and then move on to another user, infecting that user's machine in the process.

Data Disks and Boot Sector Viruses

How does a boot sector virus get from a non-bootable floppy disk to a hard disk? It's simple. You put an infected disk in drive A and copy a file or two from it or to it. Perhaps you edit a file on drive A. You may see the message:

Non-System disk or disk error
Replace and press any key when ready.

You open the drive door and press Ctrl+Alt+Del. But it is already too late. The virus has already been run as your machine tried to boot from drive A. For many common boot sector viruses, it has infected your hard disk. When you press Ctrl+Alt+Del, you boot from your hard disk, first putting DOS in memory. From now on, every time you access a floppy disk in drive A, or B, you'll infect it.

The morals of this story are as follows:

- (a) You must learn to remove all disks from your disk drives immediately after using them so that you don't accidentally boot from them.
- (b) You must never turn on the machine or press Ctrl+Alt+Del without first ensuring that the door to drive A is open.
- (c) If you normally boot from a floppy disk, it should be your own, personal floppy disk, and it should have a write-protect tab.

- (d) If you have two drives, you should always try to use drive B for reading and writing floppy disks, and as much as possible try not to use drive A.
- (e) With machines that normally boot from the hard disk and that have only one floppy disk drive, you should make that drive B, not drive A, to prevent accidentally booting from it. This can be done by changing the cable connection on the back of the drive, or by moving a jumper on the drive.

Unless you need to write to a floppy disk, they should have a write-protect tab on it. This prevents infection of programs on the disk and prevents infection of the boot sector. Although a write-protect tab on a floppy disk won't protect a hard disk from a virus on the floppy disk, it will protect the *floppy disk* from a virus on the *hard disk*.

Backup

Backups can't prevent viruses, but they can prevent the damage. With a good set of backups, a virus is nearly no problem at all. Without a good set of backups, a virus can mean the end of many organizations. Here are the most important things to remember.

- (a) Back up your hard disks often. The more important the information stored on the hard disk, the more important it is to back it up often.
- (b) Back up selectively, if this will increase backup speed. Consider backing up everything weekly, and backing up essential, live files daily.
- (c) Keep multiple sets of backups. If you happen to back up files containing a virus, your previous set of backups may be virus free.
- (d) If you are backing up to tape, back up by file rather than by image, so that if a virus is later detected and removed, you can omit from your restoration any infected files on the backup tape.
- (e) Be sure to check for viruses after restoring from your backups. As many as nine out of ten people who eradicate a virus find it back in a month. Infected backup disks can be the culprit.

DETECTING VIRUSES

There are two secrets about virus detection. The first is that viruses are easy to spot. They drip letters from your screen or put black holes on the screen or turn the letters on the screen upside down or play tunes. The other myth, surprisingly, is just the opposite: viruses are so sneaky that you couldn't catch one with anything but some magic software. For this magic software, nearly everyone thinks "scanner". The fact is that most viruses that spread well show no symptoms, and

there are many ways that you can detect and remove a virus with your bare hands!

The next sections discuss several categories of anti-virus software:

- (a) Checksumming
- (b) Scanning
- (c) TSRs and device drivers

Checksumming

The fundamental fact of a virus is that if it is to add its code to another program, it must somehow change that program. So keep a watch on the size of the file.

Why Detect Changes?

There are several good reasons why you should detect changes:

- (a) Viruses have great difficulty infecting your machine without making some change in it. To detect a change is to begin the process of detecting a virus. Although some are concerned that a change-detecting program can't prove there isn't already a virus in your computer. The fact is that you needn't worry about this. If you infect your computer with a dozen viruses, and then measure your computer's state, one of the viruses will change that state in the next hour or so; a remeasurement establishes that something is wrong.
- (b) Occasionally things go wrong with computer hardware and software. You run CHKDSK and discover many lost clusters in many lost chains. You scrap these clusters, but wonder what files you've lost. A proper change-detection program will give you a list of files deleted since your last run. You can then restore them from your backups.
- (c) In many organizations, you only want to permit the use of authorized software. Using a proper change-detection program, you can establish what software was added to the machine since your last run. Any extra software will quickly come to your attention.

Each file has a unique fingerprint in the form of a checksum. Changes in any character within the file likely change the checksum. If a file's original checksum is known--perhaps recorded in a file elsewhere--and its current checksum is known, the two values can be compared. Any difference indicates that the file has been changed, and offers reason to investigate further. If a program's size is changed, it must be concluded that some modification has occurred to the file. If the size has not changed, some modification is still possible.

Scanning

Virus scanners are products designed to help identify viruses within files, boot sectors, master boot sectors, memory, and other hiding places; to name them; and potentially to help remove them. The capability to detect and identify a virus is probably the most important feature of a scanner.

A scanner is critical for providing a precise identification of a virus in your system. Without a precise identification, you can't know the best course of action for removing it, and you can't be sure that you have removed it completely.

The scanner is the only kind of anti-virus program that can spot a virus before it runs. Thus, if you use a scanner to check new software before running it, you can prevent even one of your files from becoming infected. Scanners are always out-of-date. Most scanners are usually somewhat incomplete when they are released. No virus researcher has access to every virus on earth. So even if your scanner was absolutely current one month ago, and caught every virus that existed on earth the day it was released, there are now 60 or more viruses that it can't catch. Although your odds of getting a brand new virus are very, very small, you must recognize that scanners will not catch everything.

DOS 6.2 comes with a scanner in the form of MSAV.EXE, the same program that you can use for checksumming.

Using a Scanner

If you plan to use a scanner, you must follow these instructions if you hope to achieve success in detecting viruses:

- (a) Cold boot the machine to be scanned from an uninfected, write-protected floppy disk. Because a virus can't get past the write-protection mechanism of a floppy disk drive. You are thus assured that no virus has moved into memory, from whence it can defeat your scanner.
- (b) Run the scanner from the disk you just booted from, and do so before running any other programs—especially programs that are on a drive other than the one you just booted from. Any device driver called by your hard disk's CONFIG.SYS file can contain a virus, as can any program called by your hard disk's AUTOEXEC.BAT file.
- (c) Scan the disk you just booted from, to ensure that it is not infected.
- (d) Watch your screen carefully during the scanning process, if your scanner does not pause when it detects a virus. In the case of MSAV, you will have to ask for a report and study report because the identifications fly by too fast on-screen.

- (e) Follow the instructions for your scanner carefully. Failure to issue the correct command line may result in a partial scan, and you might inadvertently skip scanning a directory that contains a virus.

Virus Scanning with MSAV.EXE

MSAV.EXE is the Microsoft anti-virus program, new with DOS 6 and 6.2. MSAV works with all prior versions of DOS. It is loosely based on Central Point Anti-Virus, sharing many of the shortcomings of that product. But MSAV is a limited version of CPAV, and does not offer all of its power. MSAV detects many viruses, and will remove some of them, so it offers some protection. In this section, you learn what MSAV does, how to use it, and its strengths and weaknesses.

Command Line Options

Even if you prefer menus to command line operation, MSAV requires command line operation if you want to scan just one file or just one directory. It can't be made to scan anything but an entire drive from the menu. You can run MSAV with several command-line options:

- /S Scans boot sectors and files. (This is the default, so you won't ever need to enter this option.)
- /C Scans boot sectors and files, cleaning them of any are found. Don't use this option until you have read the section on "Removal".
- /R Generates a report on your activity, which is a great idea. It creates a file named MSAV.RPT in the root of the drive from which you ran MSAV, overwriting any previous copies of this report.

TSRs and Device Drivers

- /A Scans all drives (including the server) except drives A and B. This speeds things up if you aren't worried about a virus on the disks in drives A and B.
- /L Scans all local drives except drives A and B. This will be your most common choice for command line operation.
- /N Indicates no interface. The contents of MSAV.TXT will be displayed instead, if it exists. In this text file, you can put any information you want, such as an explanation of what is happening and what the user should do if a virus is detected.

You probably will choose this option for command-line operation in batch mode. If the text file does not exist, your screen will display...

```
MSAV Copyright (c) Symbol 1991 - 1992 Central  
Point Software, Inc.  
Working....
```

....and the path and file names as scanning takes place.

- /P Displays the command line interface, rather than the graphic interface. This interface offers more information on what is happening than the /N option, telling you when it is mapping disk directories, scanning memory for viruses, and scanning files for viruses. If used with the /N option, it overrides /N.
- /F Prevents display of the means of the files scanned. You can use this option only if you have chosen /N or /P. If, for example, your command line is....

```
MSAV /L/N/P
```

then you will just see:

```
MASV Copyright (c) Sign 1991 - 1992 Central  
Point Software, Inc.  
Working....
```

- /VIDEO Displays help for the video and mouse command line options. Use this switch to find the various switches that can be used to control your screen display and mouse operation when in menu-driven mode. Using....

```
MSAV /28/
```

...for example, will run MSAV in menu-driven mode, with a 28-line screen for your VGA.

- /H Displays a help screen showing the various options other than those controlling video and mouse (/VIDEO).

If you want to exit MASV after beginning a scan (perhaps because you find it scanning server), you can press Esc (key symbol).

Menu-Driven Operation

When you simply type **MSAV** OR **MSAV** with any of the mouse/ video options, you see a menu. You normally set Options once, and never need to touch them again, because they are saved in a file named **MSAV.INI** and take effect on each

successive run until changed. Display the Options menu by pressing F8 function key. Here is what each of the options mean:

Verify Integrity

It is used in a session after a session in which you have chosen the second option, *Create New Checksums*. *Verify Integrity* compares each file with information you have stored on it in a file called CHKLIST.MS, matching the file's size, attributes, date, time, and checksum. If any of these items is changed, MSAV sounds the alarm (if turned on) and indicates *Verify error*. If you read the report created by MSAV, you will be able to learn where this verify error occurred. It wouldn't hurt to have this option always turned on.

Create New Checksums

It generates the file CHKLIST.MS in each directory scanned. If the file already exists, then information on new or changed files is added to it. The first time you choose *Create New Checksums*, your scanning is slowed slightly as the CHKLIST.MS files are created. On subsequent runs, your speed increases dramatically. You should know that if you add files to a directory, information on these new files will not be added to CHKLIST.MS unless you have this option turned on. The CHKLIST.MS file does not contain information on spreadsheets, database, and documents, so you need not worry that these will often be changing and spoiling your efforts at checksumming. If you ever plan to verify integrity, you should create new checksums just after installing any new software.

Create Checksums

Create Checksums on Floppy is useful when some virus modifies the check list.

Disable Alarm Sound

Prevents, when checked, the alarm from sounding when a virus is detected.

Create Backup

Backs up any infected file before attempting to remove the virus from it.

Create Report

Create report is an option that should always be chosen, because you might otherwise miss the information that MSAV found in your computer. MSAV fills your

screen with pretty boxes and buttons, but only contains a short line showing Last Virus Found. To get maximum information out of the report created, you can add...

```
MSAV/L/N  
MORE |TYPE C:\MSAV.RPT
```

...or...

```
MSAV/L  
MORE |TYPE C:\MSAV.RPT
```

...to a batch file that calls MSAV.

Anti-Stealth

This is intended to help detect stealth viruses. Because there are now many stealth viruses, it seems wise to always have this option checked.

Check All Files

It shouldn't be used unless you can think of a good reason. When the option is not checked, you check only executable files: EXE, COM, OVL, OVR, SYS, BIN, APP, CMD, master boot records, and boot records. When the option is checked, you scan everything. Because a virus can't execute from a nonexecutable file, few viruses have any interest in infecting such things, and the infection of text files can hardly be of concern. If a virus adds its code or otherwise learn about the problem when you try to load the file with your application software. Checking all files may increase your scan time by a factor of three or more, so don't waste your life by scanning everything.

Speed Consequence of Various Options

MSAV performs at two basic speeds: one speed when scanning is done, and another speed when checksumming is done. When checksumming is done, your speed after the first run is about four times as fast as when pure scanning is done. Choosing Verify Integrity from the menu permits checksumming, and checksumming permits MSAV to ignore scanning unless a checksum mismatch is found. It is, therefore, recommend that you always have Verify Integrity checked. You should normally run MSAV with the following items checked:

- (a) Verify Integrity
- (b) Create Report
- (c) Anti-Stealth

It is further recommended that you do not check the following items:

- (a) Create Checksums on Floppy (too slow).
- (b) Disable Alarm Sound (You get an alarm sound from your PC only when you have a virus or false alarm, and you will certainly want to know when this happens).
- (c) Check All Files (unnecessary and too slow).

When should you create checksums? The best time is just before installing new software, when you trust your system and believe it to be uninfected. When should you verify integrity? The best time is just after installing new software and running it; if a virus is going to come out and modify your existing software, it will likely do it now.

HOW GOOD IS MSAV AS A SCANNER?

Here are some of the facts about MSAV as a scanner:

- (a) MSAV can detect the 10 most common viruses, which account for 90 percent or so of all infections.
- (b) MSAV can probably detect most of the 100 or so viruses found from time to time in the world.
- (c) MSAV detects many of the polymorphic viruses, but misses some copies of viruses, such as Involuntary and V2P2/Chameleon.
- (d) MSAV detects Frodo if it is in memory, and removes it from memory. But MSAV does not notice that Frodo has just infected MSAV, and doesn't report this.
- (e) MSAV is not particularly fast.
- (f) MSAV misses quite a few viruses.

What is Boot-Sector Problem ?

Although MSAV might detect a boot-sector virus (such as STONED or Michelangelo), it may fail to clean it. This problem can be caused either by the virus begin on a DoubleSpace-compressed drive, or by the fact that all the virus code is not being overwritten. In the first case, boot-sector viruses alter the DOS startup code located in the boot sector of your hard disk and activate when you start your computer from the infected drive (usually drive C). Double Space compressed drives do not actually have MS-DOS startup code to corrupt. You can, however, force MSAV to clean all drives, including compressed and host drives, by adding the /C switch.

In the second case, when a boot-sector virus infects a hard disk, it moves the original boot-sector information to another location on the disk and replaces it with virus code. MSAV then finds the original boot-sector information and uses it to overwrite the virus code. The problem arises, however, when the original boot-sector information is incomplete or damaged in some way; the result is that some of the virus code may not be overwritten. So, when MSAV scans the drive and finds the remnant of the virus code, it reports it as a virus.

To solve this problem, first run CHKDSK. If it reports 655,360 total bytes of memory, you know that the virus is not active. To proceed, back up all your data, run FDISK / MBR (if the disk was partitioned with FDISK. Perform a cold start, and then run MSAV again to verify that the problem has been solved.

If, on the other hand, CHKDSK reports fewer than 655,360 total bytes of memory, the virus may be active and that you need to do the following:

- (a) Boot from a write-protected system disk that you know is virus free.
- (b) Insert Disk 3 of the DOS 6 Upgrade set in drive A, or disk 4 of DOS 6 floppies log on to A, enter **MSAV C: /C/L**, remove the disk, and then reboot.
- (c) Scan all hard disks again to ensure that the virus has been removed.

THE DOS 6.2 ANTI-VIRUS TSR VSAFE.COM

DOS 6.2 comes with a TSR named VSAFE.COM. It is based on one of two TSRs that Central Point offers with Central Point Anti-Virus. (CPAV also offers two device drivers not include with DOS 6.2). In testing of anti-virus products done in mid-1992, VSAFE.COM was in the top quarter of the products rated, trailing XTree ViruSafe LAN, XTree ViruSafe, Dr.Solomon's Anti-Virus Toolkit, and Norton AntiVirus.

VSAFE.COM has these Strengths:

- (a) Monitors files copied to and from the server.
- (b) Adds an insignificant amount of time to the boot process and the time required to load applications.
- (c) Can be loaded high with MS-DOS 6.2, and with QEMM.
- (d) Takes about 44K of memory, which may or may not be acceptable.
- (e) Can run while *Windows* is running. If you will be using Windows, load the VSAFE manager (WNTSRMAN) to ensure that VSAFE messages are displayed in Windows. Do this with this line in WIN.INI.

```
LOAD=WNTSRMAN.EXE
```

Running VSAFE.COM is simple. To get your list of options, type **VSAFE/?**

Switches for the numbered options are set with a plus or minus. To turn on option 1, for example the syntax is....

/1+

To turn it off, the syntax is....

/1

Switches can be listed in any order, and are not case-sensitive. Precede each switch with a slash (/). Your options include:

- /1+ Warns of formatting the hard disk. The default is on, so you'll only use this with /1+.
- /2+ Warns when any program attempts to become memory-resident. The default is off; turn it on.
- /3+ Prevents programs from writing to disk. The default is off. Leave it off except perhaps when testing new software.
- /4+ Checks executables for viruses before permitting DOS 6.2 to load them. The default is on, which is where it should stay.
- /5+ Checks all disks for boot and master boot viruses. The default is on; leave it on.
- /6+ Warns of attempts to write to hard disk boot sector or master boot sector. The default is on; leave it on.
- /7+ Warns of attempt to write to the boot sector of a floppy disk. The default is off. Turn it on unless you do a lot of floppy disk formatting.
- /8+ Warns of attempt to modify executable files programs. The default is on; leave it on.
- /NE Excludes monitoring of expanded memory.
- /N Permits network drivers to load after VSAFE is loaded. This reduces the interference caused by /2+. Use it if you load VSAFE before IPX.
- /D Turns off checksumming. This speeds things up a bit, but makes it harder to detect unwanted change.
- /U Removes VSAFE from memory. This is a handy switch if you are trying to run a big program that needs all the conventional memory it can get, and you don't have enough upper memory blocks to load VSAFE high. Your batch file can look like this:

```
REM Remove VSAFE from memory:
VSAFE/U
```



```
REM Run MightFat program, that needs this
memory:
MFAT
REM Now that you've exited from MFAT,
you can put VSAFE back in business:
VSAFE/2+/7+/NE /NX
```

Confirming Your Anti-Virus Software's Hunches

Not every suspicious activity turns out to be a virus. You can do much to help ensure a minimal number of false alarms

False Alarms

A false alarm is when an anti-virus product produces a report of a virus, when, in fact, there is no virus in the location the product is examining. False alarms occur in two general locations:

- (a) Memory
- (b) The drive surface.

The memory-related false alarm is upsetting. Turning the machine off and back on clears memory, and a second pass with the scanner that displayed the false alarm now shows memory to be uninfected.

The other kind of false alarm occurs when an anti-virus product concludes that a file is infected. This conclusion is normally based on a match of as few as 10 consecutive bytes between the file being examined and a file of scan strings that the anti-virus product is using. These scan strings, it is widely understood, provide a useful first approximation to answering the question, "Does this file contain this virus?" If part of the virus code is found in the file, then you certainly have reason to look more closely. It is now the task of the anti-virus product to confirm that the file is, indeed, infected with this virus.

Suspicious Behavior

Some alert users spot suspicious activity without the help of an anti-virus product. Not all these suspect behaviors turn out to be viruses. The following list helps familiarize you with some common problems that seem like viruses but aren't:

- (a) Your machine won't boot. This is quite likely a hardware failure. Viruses rarely do this much damage.
- (b) You see 1701 on-screen when you turn on your computer. 1701 is the number of the Starship Enterprise and is the error code you see when your hard

disk subsystem is not working properly, during the power on self-test. Any number of hardware problems might be the cause, but this is not a virus because you have not succeeded in reading one byte from the hard disk yet.

- (c) You tried booting and the computer told you that you were using the wrong version of COMMAND.COM. A virus won't modify COMMAND.COM so that an error message is produced.
- (d) You just ran CHKDSK and were told that you had lost clusters and file allocation errors. You also had a cross-link. If you haven't run CHKDSK in some time, or haven't corrected such problems with Norton Disk Doctor or CHKDSK/F, then the problem is normal if unfortunate. Most undoctored machines have some problems like this, which can be caused by dBASE, Windows, or just about any program crash. A few viruses causes progressive cross-linking, but you are not likely to have one of them. Keep your eyes on the machine, run CHKDSK or Norton Disk Doctor more often, and see what you can learn.
- (e) You just discovered some bad sectors when you ran CHKDSK. Some boot sector viruses will place programs in certain locations and mark those sectors as bad in the FAT (for example, Brain and Italian). Nearly every hard disk, however, will have some bad sectors. It is probably nothing to worry about.
- (f) You tried copying a file, but got the following message:
 Error reading drive or Sector not found
 Chances are your drive is due for a low-level format. With most older drives (ST-506, MFM, nontranslating controllers). You can run Norton Disk Doctor, Norton Disk Test, SpinRite, HDTest, Calibrate, or any other software to correct the problem.
- (g) You see the message, your PC is now stoned! When you turn on your computer. Is that a virus? Yes. That's the Stoned/Marijuana/New Zealand virus. If you have a black rectangular hole on-screen, you may have Jerusalem. If the letters you type in DOS are displayed in funny colors, it might be Devil's Dance. None of these things seem to be the result of hardware failure, but of some strange additional controlling force.

Real Symptoms

Now that you know about the situations that look like viruses but actually aren't, you should study the following symptoms, which are not likely to be caused by hardware failure but by something else:

Changes in the Size of Programs

A program larger (by a few hundred bytes or more) than another copy of it has probably been infected by a virus. Viruses never make programs smaller.

Changes in the Time Stamps

Most viruses won't affect the date or time stamp, but a few do. If you see a date stamp on a COM or EXE file more recent than when you installed it, you can be suspicious.

Slower Loading Times

If a program seems to take a bit longer to load than normal, it may be that a virus has infected it. Check to make sure that nothing has changed in your computer's configuration that might account for this.

Slower Operation

Some viruses slow a program after it has loaded.

Unexplained Reduction in Available Memory

Running CHKDSK shows you how much memory is available. This value should be the same whenever you boot. If you find less, it may be due to a memory-eating program you have run or possibly a virus.

Bad Sectors on Your Floppy Disk

CHKDSK tells you that you have bad sectors on a floppy disk today, and you didn't have bad sectors yesterday on that floppy disk, a boot sector virus may have written some code to those parts of the disk, and marked them bad. You probably have a boot sector virus.

Programs Disappearing

You run a program that was in this directory last time you looked, but you see an error message....

to execute filename

When you run it now, a virus might have deleted it. Run some other program from that directory, and see whether this error message repeats. If both have been erased, you probably have a virus.

Unexpected Reboots

If your computer unexpectedly reboots after running your program or when you are doing nothing, a virus might be playing tricks.

Odd Screen Action

If you see characters dripping from the screen, balls bouncing, ambulances driving across the horizon, screen colors changing, a black square on-screen, an unexpected message, or anything else unusual, you may have a virus. In general, a virus may be responsible for a wide variety of odd behavior. One strong symptom (such as a message) or two or more weak symptoms (such as a reduction in memory and an unexpected drive light on) should get you investigating. If you suspect a virus because of the behavior of your computer or software, boot clean and run either MSAV and check. Consider running a newer scanner, say *Nashmem*. Remember, no matter how good your scanner is today, it will not be adequate in a year unless you update it. This won't be as true of checksum or TSR approaches.

RECOVERING FROM VIRUSES

If you find a virus in your system and can establish precisely what it is, it is time to remove it from your system. Because the focus of this chapter is MSAV, you first learn about the removal process using MSAV.

Do not use MSAV, MWAV, or any other product to remove a virus until you read the "Removal strategies" section later in this chapter.

Using an Anti-Virus Product

Most anti-virus products offer virus removal capabilities. Usually these functions are built into the scanner, giving you the option to remove a virus from a file the moment it is detected in the file.

Removal of some viruses is fairly straightforward for anti-virus products. Removal of others is more difficult. Many anti-virus products can remove some viruses, but can't remove very many. When choosing a product, ask whether the product can remove all common removable viruses.

Some viruses can't be removed, no matter how clever the author of the anti-virus software. This is because the virus has overwritten some of your original

program, effectively erasing it. Without a knowledge of what was supposed to be where the virus "sat down," all an anti-virus product can do is offer to delete the entire program.

The Microsoft Antivirus Utility (Msav)

DOS 6 & 6.2 come with a file MSAV.EXE. This is usable without installing the DOS 6 or 6.2 on your system. To install this, you have to put the disk containing MSAV.EXE file in Drive A: and load it by giving the command MSAV. The next you can understand from the screen.

Virus Detection Strategy

If the virus is detected in memory, but not in any files, and if the virus detected is an extremely rare virus, ask yourself whether another scanner was just run. Any scanner that leaves in memory the scan strings it was using can produce a false alarm when another scanner runs.

If the virus is detected in only one program on your hard disk, ask yourself how often you have used this program. If you have used it several times in the past, then any virus in it has had an opportunity to infect other files. If it has not done so yet, it probably a false alarm. Don't delete the single program in which the virus was reported. And don't attempt removal. Instead, reboot from an uninfected, write-protected floppy disk, and run another scanner to determine if it, too, finds something in this file. If it doesn't assume that it is a false alarm.

If the virus is detected in several program you use commonly, you almost certainly have an infection. Do not attempt to remove the virus with an anti-virus product yet! You may cause irreparable harm to your files! Instead, read the next section carefully, and follow the steps outlined there.

HOW TO REMOVE A VIRUS ?

Removing a virus is always a risky business. You should read this section, understand the principles, and follow these steps in sequence:

- (a) Turn the computer off at the switch. Doing so will remove any virus from memory. Now find a rescue disk you have previously created. This disk should be bootable with DOS 6 or DOS 6.2 and should contain MSAV.EXE or your favorite anti-virus program. It must be write-protected.
- (b) Boot the computer with this disk in drive A. If your machine's setup instructs the machine to boot from drive C: first, you need to press a key

during the boot process, run Setup, and change this to drive A. You must "boot clean" because, if you boot from the infected drive, you risk putting the virus into memory. A virus that is in memory can interfere with clean up. It can even use the scanner as a means of spreading. (Frodo, for instance, infects every file that is scanned, if it is in memory when you run your scanner).

- (c) Don't run any programs from the infected drive. Instead, scan from your clean program, telling the program only to detect, not detect and remove. Identify a few infected programs. Copy these infected files to a floppy disk. Now run the scanner against that disk, telling it to remove.
- (d) If your scanner reports that it is unable to remove the virus, you will have to go scanner shopping. Before buying the product, ask the vendor if the scanner can remove the virus you have detected. Don't bother buying another scanner if it is unable to remove this virus.
- (e) If your scanner can remove the virus from the copy of the infected files, then let it do so. Now look at these files carefully. If they are the same size as the original copy or a bit larger, then the virus may have been removed successfully. If they are smaller than the original, they have been damaged by the scanner, and you must not use the scanner to remove this virus from anything. Use another product.
- (f) If the size of the cleaned files is acceptable, scan them with another scanner to see whether it reports a virus in any of them. If it does, it is because the scanner that cleaned left a bit of virus code in the cleaned file. Although this bit of virus code may be nonfunctional, the false alarms it causes may be costly. Use another scanner to do removal.
- (g) If the size of cleaned files is acceptable and your second scanner finds the cleaned files to be virus-free, you should try running each of these samples to see whether they still operate as they should. Some anti-virus products damage files in such a way that they will not operate correctly. You don't want to damage thousands of files on your server. Only if all of these tests are met should you use your product to clean files infected with this virus.
- (h) You should know that many scanners do a fine job removing a virus from files over a certain size (but not smaller), or from COM files (but not EXE files), and so forth. After removal, study the report carefully to determine whether the scanner claimed to remove all copies of the virus from each file. And run another scanner against the drive to make sure that it has not found any trace of the virus.

Home-Grown Virus Removal

If you don't use an anti-virus product, can you remove a virus? The answer is yes. There are many programs that will effectively remove certain viruses from your system. Some of these tools are tools you already own, such as SYS, FORMAT, and FDISK. Others are special tools you can purchase. Some virus-removal tools are specialists in master boot record or boot record repair. Others specialize in removing viruses from files. And a few can do some of both.

For a master boot record infection, you can boot clean (from an uninfected, write-protected floppy disk), and then run FDISK/MBR with both DOS 6 and DOS 6.2. For a boot record infection, you can run FORMAT (writing a new boot record) and then run UNFORMAT (to recover everything that FORMAT has lost due to the original boot record). For infections of your programs, you can delete all infected files, replacing them with clean backup copies.

If you can learn some key details about your virus, you can safely restore files from infected backups. If, for example, you know that your virus infects only COM files, you can restore all other file types from infected backups and replace any infected COM files with copies from uninfected backups.

If you learn that your virus is a boot sector virus, then you know that none of the files in your backups will be contaminated. Once the boot sector virus is removed from memory, and you have booted from an uninfected disk, you will be able to restore all files from backups infected with a boot sector virus. Just remember not to accidentally boot with one of these floppy disks!

VIRUS REMOVAL STRATEGIES

Having procedures in place to detect viruses is important. But just as important is a plan for how you will remove whatever you find.

Don't Panic

You must remember that the majority of virus alarms turn out to be false alarms, and are the result of some user, software, or hardware error. Proceed with your detection assuming that, although it may be a virus, it is just as likely to be something else, so note all symptoms carefully, and see what the combination points to.

If the problem turns out to be a virus, it is still important not to panic. You need a cool head to minimize further damage and to remove the virus as cleanly and efficiently as possible. Don't just get out your copy of FORMAT or FDISK and start formatting the hard disk.

Devise An Action Plan

It might be a good idea for you to have some action plan ready in the event that your organization has an infection. Some of the details to be covered by such a plan are described in the following list.

- (a) Take notes on where the virus has surfaced, and try to draw some intelligent conclusions of how it might have gotten there, and where it might have gone from there.
- (b) Users who try out the most software are likely to be the most vulnerable. And users with the greatest access to files and machines—the help desk, network manager, and other support staff—are the most common carriers of viruses once the virus has gotten in.
- (c) Terminate network connections. Until the virus is removed from the sever and prevented from reentering the server (through directory-level access controls, nonstop server scanning, an antivirus NLM, and so forth), your network provides a terrific means of spreading it. If you clean 99 of 100 workstations and the remaining workstation logs in to the network, you may have 100 more workstations to clean.
- (d) Brief all users and staff about the situation and give them useful, concrete tasks to perform to help protect themselves, search for additional copies of the virus, and remove any copies found.
- (e) Isolate all systems from each other during the disinfection process, as far as you can. Each office containing an infected system should be closed to distributing disks and files to the outside world until it is virus-free (including every single disk in that office), and each system that is virus-free should temporarily be closed to receiving disks and files from the outside world, until that world can be trusted. Without such isolation, users can spread the virus faster than you can crush it.
- (f) Arm yourself with the very best anti-virus software.
- (g) Arm yourself with thorough information about the virus you have discovered. Read what you can about this virus in your virus book.
- (h) Remove every single copy of the virus. You want to remove every single copy of the virus from the premises. This removal includes every single copy on every single hard disk, and every single floppy disk.
- (i) Watch for reinfection. If you have just removed a virus from a system and cleaned every single disk on site, you should not yet breathe easily. You are very likely to get another infection in the next few days, from some unnoticed copy of the virus or from the same outside source which you got the first infection.

Some vendors and "experts" have dramatized the virus problem beyond the facts, and your probability of infection is still quite low. And, despite what you can hear from competing anti-virus vendors, DOS 6 & 6.2 come with a free anti-virus program that is easy to use, will detect nearly every virus you are likely to get in the next year or so, and can remove many of them.

Your best defense against viruses is not software, as many think. It isn't learning how to use MSAV, MWAV, or VSAFE. Your best defense is good common sense, behaviour that minimizes your risk, and intelligence in responding to both false alarms and the occasional real virus. Do what you can to prepare for the big day when a virus is detected.

DESCRIPTIONS OF COMMON VIRUSES

If you get a virus, it is likely the one described below. Depending on the anti-virus program you use, the virus identified may or may not have the primary name used in this section—you should check the list of synonyms.

Cascade Family

Virus Name:	Cascade Family
Synonyms:	1701, 1704, Falling Letters, Falling Tears, Fall, Autumn Leaves, Second Austrian, Blackjack, Autumn, Waterfall, Russian, Hailstorm
Date of Origin:	October, 1987
Place of Origin:	Switzerland or Germany
Isolated by:	Rudolf Rindler
Host Machine:	PCs and compatibles.
Use of Memory:	Resident, takes up 2 KByte
Infects:	COM, COMMAND.COM
Encryption:	Self-encryption
Symptoms:	In the original version, if the system month is between October 1 and December 31, the system year is either 1980 or 1988, and the monitor is either CGA or VGA, a cascade display is activated at random intervals. In subsequent modifications, any month and year will do. The cascade display consists of characters falling from the screen, landing and remaining on the bottom line. You

	also can hear a click from the speaker each time a character "hits" the bottom of the screen. The virus spreads well because these symptoms are not normally displayed.
Damage:	Affects system run-time operation. Corrupts COM files. Often produces no obvious effects, and thus can be difficult to detect. Can cause problems on Novell networks.
Prevalence:	Among the most common viruses
Derived from:	A NumLock utility Trojan horse
Scan Code:	Uses self-encryption. FA 8B EC E8 00 00 5B 81 EB 31 01 2E F6 87 2A 01 01 74 0F 8D B7 4D 01 BC 82 06 31' 34 31 24 46 4C 75 F8.
	You also can search at offset 01 BH for 31 34 31 24 46 4C 75 F8.
	To find the 1704 version, use 0F 8D B7 4D 01 BC 85 06 31 34 31 24 46 4C 75 F8.
	To find the Y4 version, use FA 8B CD E8 00 00 5B 81 EB 31 01 2E F6 87 2A 01.
	To find the Format version, use 0F 8D B7 4D 01 BC 85 06 31 34 24 46 4C 77 F8.

Notes Cascade was adapted from a Trojan utility which turned off the Num Lock light and mode. The Trojan caused characters on CGA screens to fall to the bottom of the screen.

Four versions of the virus exist:

- (a) The 1701 version increases the size of COM files by 1,701 bytes, and infects machines containing an IBM copyright notice in the ROM and clones.
- (b) The 1704 version increases the size of COM files by 1,704 bytes.

The Cascade family of viruses is unique in several ways:

- (a) The virus is encrypted (apart from the first 35 bytes) using an algorithm that includes the length of the host program so that every sample looks different.
- (b) The mechanics of its activation are complex, being based on randomizations, machine types, monitor type, presence or absence of clock cards, and time of year. In early versions, the virus activates

on any machine with a q CGA or VGA monitor, in the months of September, October, November or December, in the year 1980 or 1988 (PC and XT systems without clock cards often have the date set to 1980).

Occasionally, 1701 triggers a hailstorm. The characters on-screen behave as if they were pinned to the screen, and someone is removing the pins one at a time—it looks a bit like a hailstorm, and has appropriate sound effects. In fact, it is a purely audiovisual effect—nothing is happening to your data. But overreaction—turning the machine off—can result in lost clusters and file damage.

You can catch the virus trying to infect a write-protected floppy disk because DOS displays the message Abort, Retry, Ignore.

DARK AVENGER 1800

Dark Avenger, the Bulgarian author of the Dark Avenger family of viruses, has distributed the source code widely. He calls this series of viruses "Eddie." The first in this series is Dark Avenger 1800, sometimes called Dark Avenger 1.

Virus Name:	Dark Avenger 1800
Synonyms:	Eddie-1, Black Avenger, Dianna, Dark Avenger 1.0, Eddie
Date of Origin:	October 31, 1988
Place of Origin:	Bulgaria
Host Machine:	PC compatibles
Use of Memory:	Resident, Stealth
Infects:	Files with the extension EXE or COM
Infectiousness:	Very high
Encryption:	None
Bytes Added:	1,800 bytes
Damage:	Substantial
Prevalence:	Among the most common viruses. Collectively, the family of Dark Avenger viruses are common in U.S., Europe, and Russia
Removable:	Yes
Related:	a, b, c, d, Hi, Rabid, Phoenix Evil, VAN soft, Dark Avenger 1800, Boroda, Ps!ko

Dark Avenger 1.31

Virus Name: Dark Avenger 1.31
Synonyms: Black Avenger, Eddie, Diana
Date of Origin: January 3, 1989. Released in early March, 1989, after some failed efforts to add self-checksum and other features to Version 1.32.
Place of Origin: Sofia, Bulgaria. Isolated at U.C. Davis, California in September, 1989.
Host Machine: PC compatibles
Use of Memory: Resident
Infects: COM, EXE, COMMAND.COM
Bytes Added: About 1,800 bytes

Damage: When memory-resident, Dark Avenger infects files through any reads, including viewing the file. It overwrites a randomly selected sector with the boot sector. Damage occurs after 16 infections, with the counter stored in the boot record.

Prevalence: Common worldwide

Derived from: Dark Avenger 1.2. According to the author, 'VERSION 1.31, 3-JAN-1989. This became the most common version of Eddie. a code was added to find the INT 13 ROM-vector on many popular XT's and AT's. Also, other messages were added so its length would be exactly 1,8000 bytes'.

Scan Code: Contains two text strings: "Eddie lives. Somewhere in time" at the start of the file and "This program was written in the city of Sofia (C) 1988-89 Dark Avenger Diana P" near the end of the infected file.

You can scan using A4 A5 8B 26 06 00 33 DB 53 FF 64 F5 E8 00 00 5E. You also can use 49 CD 21 BB FF FF B4 48 CD 21 81 EB E7 00 72 7B.

You can also use 9D, 73 48 2E 3B 1E 08 07 75 3A 85 DB 74 36 E8 AB 02 9D E8 83 00 72 34.

Related The author has distributed source code on European bulletin boards, and the virus is in wide circulation.

Notes Dark Avenger not only infects generic COM and EXE files, but also COMMAND.COM. Only files larger than 1,774 bytes are infected. Once in COMMAND.COM, the virus even replicates through the DOS COPY and XCOPY commands, with both the source and destination files being infected in the COPY process. The virus has been named the Dark Avenger because this code appears within the virus. Dark Avenger 1.31 increases the length of infected COM files by 1,800 bytes. EXE files are rounded up to the next multiple of 16, and the virus is appended. Dark Avenger 1.31 stays resident in memory (by means of manipulation of memory control blocks) and infects files by means of many DOS functions (such as OPEN, CLOSE, EXEC). For this reason, a file can become infected, not only when it is executed, but even when viewed with PC Tools, when located with some file find program, when copied with COPY or XCOPY, or when read by some anti-virus scanner!. During copy commands, both source and target files become infected. If anti-virus software attempts to set some of the virus's vital interrupts through SetVector, Dark Avenger 1.31 prohibits this. If the antivirus software directly changes the vector table, when the software terminates (by means of Terminate-and-Stay Resident), the virus restores its vectors. As an extremely infectious virus, treat Dark Avenger cautiously.

Frodo

Virus Name:	Frodo
Synonyms:	Century, 4096, IDF, 100 Years, 4k, Hidden
Date of Origin:	October, 1989
Place of Origin:	Haifa, Israel
Host Machine:	PC compatibles running DOS 2 or later
Use of Memory:	Resident, Stealth
Infects:	COM, EXE, COMMAND.COM, OV*
Infectiousness:	Very high
Encryption:	None
Symptoms:	Nearly undetectable. COM, EXE, and overly files grow in size, but the resident virus hides this growth. Cross-links can occur.
Bytes Added:	4,096 bytes for both COM and EXE files. When memory-resident, no change in file size is detected.

Damage:	Substantial. Infects COMMAND.COM, COM, EXE, and overlay files as they are opened (run, copied, or xcopied, attribute changed, or created). From September 22 until December 31, attempts to place a Trojan in boot sectors that is intended to display the message FRODO LIVES but which can hang up the system.
Prevalence:	Among the most common viruses
Removable:	Yes
Related:	Frodo.A, Frodo.B
Scan Code	E8 08 0B E8 D0 0A E8 9A 0A E8 F6 0A E8 B4 0A 53 You also can use 87 5E EC FC C3 83 C3 03 81 FB CC 02 72 E9 5B E8 89 0A E4 21.
Research by:	Fridrik Skulason, Alan Solomon

Notes Frodo infects COM, EXE and overlay files, adding 4,096 bytes to their length. After the virus is resident in memory, the increase in a file's length is not evident from the directory listing. This is done by modifying the first/next function returns so that files with the year greater than 100 are reduced by 4,096 bytes in size. Moreover, once in memory, Frodo infects any executable file that is opened, including those opened with the COPY or XCOPY command. If the virus is present in memory and you attempt to copy infected files, the new copy of the file will not be infected if the extension is neither COM nor EXE. Thus, one way to disinfect a system is as follows:

- (a) Copy all the infected files to disks with a nonexecutable file extension. You might, for example, type...

```
COPY *.EXE *.E
```

and

```
COPY *.COM *.C
```

- (b) Shut the system off. Reboot from an uninfected and writeprotected disk.
(c) Delete any infected files and restore the backed-up files to the original executable file names and extensions. Type....

```
COPY *.C *.COM
```

and

```
COPY *.E *.EXE
```

This procedure does not save any cross-linked files, however.

On September 22, the virus attempts to modify the boot sector. Systems infected with this virus can hang after September 22 of any year, due to a bug that sends the system into a loop. The virus contains an unused boot sector which, if copied to the boot sector of a disk, displays the message FRODO LIVES. The message appears in large letters on-screen, surrounded by a moving pattern.

Green Caterpillar Family

Virus Name:	Green Caterpillar
Synonyms:	1575, 1591, 1591/1575, Green Caterpillar.1, 1577
Date of Origin:	February, 1990
Place of Origin:	Taiwan
Host Machine:	PC compatibles
Use of Memory:	Resident
Infects:	COM, EXE, COMMAND.COM, OV*
Infectiousness:	Very high
Encryption:	None
Bytes Added:	1,575 to 1,591 bytes
Damage:	Minor
Scan Code:	1F B8 00 01 50 33 C0 CB BE 06 00 AD 3D 92 01 74 DD 3D 79
Propagation:	infects when a DIR or COPY command is issued, rather than when files are executed. Becomes memory resident when an infected COM or EXE is run.
Removable:	Yes
ResQ:	Some researchers suggest that Green Caterpillar only triggers on ATs or PS/2s with a CMOS clock.
Related:	Green Caterpillar.1, Green Caterpillar.2, Green Caterpillar.3
Research by:	Alan Solomon

Notes Although Green Caterpillar does not reset the date and time stamp, it has become very common. It displays a green caterpillar moving across the screen, munching characters, at some point after a file has been infected for two months.

Jerusalem. Standard

Virus Name:	Jerusalem. Standard
Synonyms:	Jerusalem, Israeli, Friday the 13th, Black Hole, Black Box, PLO, 1808 (EXE), 1813 (COM), sUMsDos, Russian, Hebrew University, Jerusalem B, JV, Black Friday, Morbus Waiblingen, Payday
Date of Origin:	December 24, 1987 (date first detected in Israel)
Place of Origin:	Israel
Author:	Probably written by the author of Suriv.1
Isolated by:	Ysrael Radai. This virus was first discovered at the Hebrew University in Jerusalem.
Host Machine:	PC compatibles running DOS 2 and later
Use of Memory:	Resident. Takes up 2K of memory when resident.
Infects:	COM, EXE. Reinfects EXE files until the file becomes too big to fit into memory.
Symptoms:	One half hour after activation, a black rectangle hole appears in the lower left of the screen. Clearing the screen removes the "black hole". The virus redirects Interrupt 8 (among others) and a half hour after an infected program loads, the new timer interrupt introduces a delay that slows down the processor by a factor of 10.
Bytes Added:	1,813 bytes for COM files. 1,808 to 1,823 bytes for EXE files infected for the first time. The reason for the range of bytes is that Jerusalem first adds a padding to EXE files to make them a multiple of 16 and then adds 1,808 bytes. The new EXE file length is, therefore, a multiple of 16 bytes. For EXE files infected for the second or third (or fourth...) time, Jerusalem adds 1,808 bytes.
Damage:	In addition to the symptoms already mentioned, it slows the system 1/2 hour after activation. It corrupts COM and EXE files. If the file length as recorded in the EXE header is smaller than the actual length of the file, the virus overwrites a portion of the file, rather than appending to it. On every Friday the 13th except in 1987, when an infected program is run, Jerusalem sets the attributes of every program that is to be loaded to

read/write, and deletes them. Users will see Bad command or filename or, in DOS 5, cannot execute drive:\directory\filename repeatedly. This continues despite any changes in the system date until the machine is rebooted. COM files larger than 63,723 bytes are destroyed by overwriting.

Prevalence:

Among the most common viruses

Derived from:

Surviv 3

Scan Code:

8E D0 BC 00 07 50 B8 C5 00 50 CB FC 06 2E 8C 06 31 00
2E 8C 06 39 00 2E 8C 06 3D 00 2E 8C 06 41 00 8C C0

You also can search at offset 095H for FC B4 E0 CD 21
80 FC E0 73 16.

And you can use 03 F7 2E 8B 8D 11 00 CD 21 8C C8
05 10 00 8E D0.

You will find the text strings "MsDos" and "COMMAND.COM" in the data area of the virus, and "MsDos" as the last five bytes of an infected COM file (this is the signature used there).

Removable:

Yes

Related:

1600, Dragon, Jerusalem Sat-13, Messina, Pipi, T1, Timor, Virus #2, Jerusalem 1244, Jerusalem 1361, Jerusalem 1605, Jerusalem 1735, Jerusalem 1765, Jerusalem 2187, Jerusalem A, Jerusalem A-204, Jerusalem Anarkia 1, Jerusalem Anarkia 2, Jerusalem Anarkia 3, Jerusalem AntiCad-2576, Jerusalem AntiCad-2900, Jerusalem AntiCad3004, Jerusalem AntiCasd-3012, Jerusalem AntiCad-3088, Jerusalem AntiCad-4096-A, Jerusalem AntiCad-4096-Danube, Jerusalem AntiCad-4096-C, Jerusalem AntiCad-4096-Chinese, Jerusalem AntiCad-Tobacco, Jerusalem Antiscan, Jerusalem Apocalypse, Jerusalem Barcelona, Jerusalem Black Friday, Jerusalem Blank, Jerusalem Captain Trips, Jerusalem Carfield, Jerusalem Clipper, Jerusalem Count, Jerusalem Critical, Jerusalem Czech, Jerusalem Discom, Jerusalem Einstein, Jerusalem Feb. 7, Jerusalem Einstein, Jerusalem Feb.7, Jerusalem Frere A, Jerusalem Frere B, Jerusalem Friday 15, Jerusalem Fu Manchu, Jerusalem G, Jerusalem GP1, Jerusalem GP1 Dropper, Jerusalem Groen Links, Jerusalem IRA, Jerusalem J, Jerusalem

January 25th., Jerusalem JVT1, Jerusalem Kylie, Jerusalem Mendoza, Jerusalem Miky, Jerusalem Moctezuma, Jerusalem Mule, Jerusalem Mummy 1.0, Jerusalem Mummy 2.1, Jerusalem Nemesis, Jerusalem Not 13, Jerusalem Nov 30, Jerusalem P, Jerusalem Payday, Jerusalem PcVrsDs, Jerusalem Phenome, Jerusalem PSQR, Jerusalem Puerto, Jerusalem Skism, Jerusalem Skism11, Jerusalem Skism12, Jerusalem SolanoDyslexia 2.00, Jerusalem SolanoDyslexia 2.01 Dropper, Jerusalem Solano-Subliminal 1.10, Jerusalem Spanish, Jerusalem Sub zero, Jerusalem sUMFDos, Jerusalem sUMsDos.variants, Jerusalem Sunday, Jerusalem Sunday.2, Jerusalem Sunday.10, Jerusalem Sunday.A, Jerusalem Sunday.B, Jerusalem Sunday.D, Jerusalem Sunday.E, Jerusalem Sunday.F, Jerusalem sURIV 3, Jerusalem Swiss, Jerusalem T13, Jerusalem Triple, Jerusalem Turkish, Jerusalem UCNDER, Jerusalem Westwood, Jerusalem Yellow

Propagation:

This virus is a memory-resident infector. Any "clean program" run after an infected program is run becomes infected. Both COM and EXE files are infected. The virus attaches to the beginning of a COM file or to the end of an EXE file. The virus becomes memory-resident when the first infected program is run, and it then infects every program run except COMMAND.COM. COM files are infected once only; EXE files are reinfected each time they are run.

Research by:

Thomas Lippke, Michael Reinschmiedt, Morton Swimmer, Ysrael Radai

Notes The Jerusalem virus is the most common file-infecting virus in the world, due in part to its intelligent coding, its nondestructiveness, and its age. Jerusalem attaches to the beginning of a COM file or to the end of an EXE file. A COM file has a five-byte marker attached to the end of the file, after the last byte of the original file. This marker is "MsDos." You see the marker twice in an infected COM file: as the last five bytes and at the top of the virus. At the top of the virus, it is preceded by "sU". (In its predecessor, this was "sURIVnn", where *nn* was the version number of

Surviv). "sUMsDos" is not usually found in newer varieties of this virus--the "sU" is nonfunctional, and the "MsDos" can be replaced with anything as a marker. In Jerusalem Blank, for example, the marker looks like "in ASCII and like "20 20 20 20 20" in hex. The virus writes the "MsDos" signature in the infected EXE, but looks for a different signature. This fact suggests that the virus escaped from some programmer's lab prematurely (if it was ever intended to have been released). Jerusalem is not a stealth virus--it does little to hide itself from the user. But it is well-written. When it tries to infect a file on writeprotected disk, for example, it traps the DOS error message write protect error writing drive so that its presence is less obvious. On the other hand, if the system day and date is Friday the 13th, Jerusalem goes for broke, trying to delete everything you run. On these days, it lets DOS display the write protect error message when it tries to set the file's attributes to read/write. Remove the tab, and it will delete your file for you. Jerusalem does not infect files it deletes on Friday the 13th. Another sign of Jerusalem's sturdy programming is that it will read the directory entry for a file it is about to infect and remember the date, time, and attributes. It then changes the attributes, if needed, to permit it to write to the file, and then allows DOS to update the date, time, and attributes in the directory with the current date and time. It then goes back into the directory and reset it to the original date, time, and attributes. It is astonishing to consider the amount of work the virus has to do to infect a file, and that it can infect a file without any noticeable delay in the file's loading time (less than a second). The names 1808 and 1813 come from the fact that files grow by 1,808 or 1,813 bytes, without changing their date and time or read, write, or hidden attributes. Although the deletion of files and the slowdown are intended effects, a bug in the program causes the reinfection of EXE files. The original virus deletes the file you were executing on Friday the 13th, but numerous variants now perform this miracle on a variety of dates.

Recovery on a non-Friday 13th is simple:

- (a) Reboot the system from an uninfected, write-protected disk.
- (b) Run your favorite anti-virus product from MSAV, and let it remove all copies of the virus from all your files.
- (c) Install an uninfected anti-virus product on your hard disk and use it to scan and clean every floppy disk in the office.

If you have lost files on Friday the 13th, recovery is nearly as simple:

- (a) Change the system date to something other than Friday the 13th, and reboot from an uninfected, write-protected floppy disk.
- (b) Simply record which files were deleted. From a write-protected disk, run an unerase program (such as Norton's QU) and unerase all these files. (If you prefer, restore them from the original disks or from backups).
- (c) Follow the procedure outlined earlier for removal.

Stoned. Standard

Virus Name:	Stoned. Standard
Synonyms:	New Zealand, Australian, Hawaii, Marijuana, San Diego, Smithsonian, Hemp
Date of Origin:	Late 1987
Place of Origin:	Wellington, New Zealand. Written by a high school student, spread by another student.
Host Machine:	PC compatibles running MS-DOS 2 and later.
Use of Memory:	Resident. The virus code is 440 bytes, taking one sector of storage. It occupies 2K of memory.
Infects:	F.boot, MBR
Encryption:	None
unencrypted text:	At offset 18Ah, you can find the unencrypted message "Your PC is now Stoned!...LEGALISE MARIJUANA!"
Symptoms:	The screen sometimes displays your PC is now Stoned! When booting from an infected floppy disk.
Damage:	Substantial
Prevalence:	Among the most common viruses
Infectiousness:	High
Scan Code:	1E 50 80 FC 02 72 17 80 FC 04 73 12 0A D2 75 0E 33 C0 8E D8 A0 3F 04 A8 01 75 03 E8 07 00

You also can search at offset 045H for B8 01 02 0E 07 BB 00 02 B9 01.

Or you can use 04 00 B8 01 02 0E 07 Bb 00 02 B9 01 00 33 D2 9C.

A variant can be detected with 04 00 B8 01 02 0E 07 BB 00 02 33 C9 8B D1 41 9C.

The virus uses a signature of EA 05 00 C0 as the first four bytes of the boot sector and will not infect a disk containing this signature.

Removable:

Yes

Propagation:

This virus consists of a boot sector only. When attempting to boot from an infected floppy disk (it does not have to be bootable), Stonedvirus immediately becomes memory-resident and infects the first hard disk. It then captures all read and write calls to drive A, checks them for infection, and infects if it does not find its signature in their boot record. When Stoned.Standard has infected the floppy disk's boot sector, the first four bytes of the boot sector are EA 05 00 C0, and down toward the bottom of the boot sector you see the messages "Your PC is now Stoned!" And "LEGALISE." (Sometimes you may see "LEGALISE MARIJUANA!") If the virus displays any messages, it is just the first part, "Your PC is now Stoned!"

During the infection, the original boot sector is copied to head 1, cylinder 0, sector 3 on a floppy disk (usually part of the root). On a hard disk, Stoned.Standard places itself in the master boot record (side 0, cylinder 0, sector 7, which is usually unused but in some hard disks can be occupied by the FAT. A variant stores the hard disk boot sector at cylinder 0, head 0, sector 2.

The virus is extremely infectious, because infection attempts are triggered by any activity that invokes INT 13h, any read or write, such as DIR or TYPE. Hard disks are infected whenever booting from an infected floppy disk.

Related:

Zapper, Sex Revolution 1, Sex Revolution 2, Teraz, b,c,d,e Sonus, Sanded, Nulls, Donald, Flushed, In love, stoned-floppy disk, Mexico, WD1, WD2, WD3, WD4, WD5, WD6, WD7, June 4, Swedish Disaster, Noint Rostov, Stoned 8, Stoned 16, Damien, Laodung, Stoned 2, Stoned Polish, Stoned B

research by:

Rainer Anscheit, Alan Solomon

Notes Stoned Standard is a polite but imperfect virus. Its author apparently intended no harm, but harm sometimes occurs anyway. If your hard disk has an RLL controller and is infected, it may no longer be bootable. If your hard disk is quite small

(10M or less) or is formatted with an old version of DOS, then Stoned will accidentally place the original master boot sector down on top of the FAT, which is stored where the author assumed there would be "slack space". This results in a trashed hard disk. Further accidental damage can be caused to 360K floppy disks with more than 96 files in the root and to 1.2M and 1.44M floppy disks with more than 32 entries in the root.

The boot sector contains two character strings: "Your PC is now Stoned!" And "LEGALISE MARIJUANA!" The first of these messages is displayed only when the last three bits of the system clock counter are zero—every eighth time when booting from an infected floppy disk. The second is unreferenced. In some variations, the message is displayed on every 32nd boot. The message does not display when booting from an infected hard disk. When the message is displayed, the system also beeps.

In the original version of this virus, only 360K 5 1/4-inch floppy disks were infected. Although the original version was incapable of infecting a hard disk, other versions (such as Stoned B) are capable of doing so. Some of the harm that any virus does comes at the hands of the recovery "experts". One calamity occurs when the expert decides to kill Stoned on a hard disk by reformatting it with FORMAT. Unfortunately, FORMAT does not touch the master boot record, where Stoned resides. What FORMAT does to a hard disk infected with Stoned is destroy everything but Stoned. Don't use FORMAT against it. Another calamity comes about with FDISK, a tool that touches the master boot record. With version of FDISK older than DOS 5, you are certain to destroy your ability to ever see any file that was on the disk. Unless you are using FDISK 5, and enter FDISK /MBR, you won't be able to destroy Stoned with FDISK. Yet another calamity is when you try running FORMAT or FDISK from a floppy disk that is not write-protected. The result is that Stoned immediately transfers itself to that floppy disk with your first DIR command. After running FORMAT or FDISK, the virus is carried on to the next computer. Beware the expert who comes to save you! He can be carrying a virus on his disks.

ERROR MESSAGES DISPLAYED BY DOS 6 & DOS 6.2

This appendix will tell you the error messages you will usually find on the screen when DOS 6 and DOS 6.2 do not understand your command. This chapter also describes the precautions you must observe in using them.

ERROR MESSAGES

A20 Hardware error

This error can occur at start-up when your system is attempting to execute the `DOS = HIGH` command in your `CONFIG.SYS` file. This command normally loads as much of DOS as possible into the high memory area (HMA). The most immediate solution is to remove the `DOS = HIGH` statement in your `CONFIG.SYS` file. The A20 refers to the A20 address line that enables programs to access nearly 64k of memory while in real mode. Another probably less desirable solution would be for you to buy a 386/486 computer which would allow this accessibility without special hardware.

Abort, Retry, Ignore or Abort, Retry, Fail

This error occurs when you type a command that the computer cannot carry out, such as when you attempt to access an empty floppy disk drive or when DOS attempts to write to your printer and it's not on a ready state.

1. If you can determine the cause of the problem based on the brief message that appears above the Abort, Retry, Ignore or Abort, Retry, Fail options, correct the problem if possible, and then press R to retry the command.
2. If you cannot correct the situation press I to select Ignore, or F to select Fail (whichever is displayed on your screen as an option). If this problem occurs with a floppy disk operation, you must switch to a valid drive. For example, if you have a hard disk named C; type `C :` and press Enter. If your disk drive A: contains a diskette, type `A:` and press Enter. The command prompt redisplay the current drive name.

Access Denied

If a file is marked by DOS as *read only* file then you can not delete or do any processing on the file. In such a case a message is displayed giving the label that the access to the file is denied. You will need to use ATTRIB command to remove the file's read-only status, remove the write protection from the disk, or change the file name specification, and then try again.

Active Code Page Not Available

The code page number is not valid for the visual display device (monitor) you are using. You should use a different code page number.

All Files In Directory Will Be Deleted ! Are You Sure?

You are about to delete all the files in the specified directory or the currently logged directory. Enter Y if you intend to do this; otherwise, enter N.

Ansi.sys Must Be Installed

You have neglected to install ANSI.SYS or have not used its syntax correctly in the CONFIG.SYS file.

Attempt To Remove Current Directory

You invoked the RD or RMDIR commands using the name of the currently logged directory. Log into the parent directory and try again. You cannot remove the root directory.

Backup Diskette Not Inserted

DOS requested that you put the last backup diskette in the destination drive, but you put in a different diskette.

Bad Command or File Name

DOS 6 did not understand the command you entered at the DOS prompt. Ensure that you have entered the command correctly and the command file can be found either on the specified directory or on the search path indicated by the PATH command.

Bad Extended Memory Manager Control Chain

A device driver is in conflict with another driver in the CONFIG.SYS file. Remove

all installable drivers that come before the problem driver, except HIMEM.SYS, and re-install them one by one until the error message reappears. You must reboot your computer each time.

Bad or Missing Command Interpreter

You have tried to load COMMAND.COM that is not compatible with the current operating system, or COMMAND.COM cannot be found. Check that the correct version of COMMAND.COM is on the root directory, and that the correct version of COMMAND.COM has been specified using the SHELL command in CONFIG.SYS.

Bad or Missing Driver

DOS 6 cannot locate the device driver file, or the file is corrupt. Copy the driver file from backup floppy into the root directory or specify the location of the file CONFIG.SYS.

Bad or Missing Keyboard Definition File

DOS 6 could not find the KEYBOARD.SYS file, or the file is corrupt. Ensure that KEYBOARD.SYS is located on the same directory as KEYB.EXE. On the safer side, copy a new KEYBOARD.SYS file from backup floppy.

Bad Partition Table

This error typically occurs because FORMAT program is unable to recognize the partition table information that FDISK has previously provided. Run FDISK again before formatting the hard disk again.

Bad Umb Number

An application has referenced an invalid Upper Memory Block address. If you receive this message at startup time, try running MEMMAKER to correct the problem. If necessary reboot using the F5 function key to by pass CONFIG.SYS and AUTOEXEC.BAT. If you receive this message when using the LH or LOAD-HIGH commands, remove the /L switch and its accompanying parameters. This message also indicates a memory addressing problem. This may need the hardware repairs.

Batch File Missing

The message appears if a batch file is erased accidentally. Rewrite the batch file or restore it using the UNDELETE command.

Boot Error

DOS 6 was not able to detect the presence of the expected peripheral like floppy drive or harddisk at the time of booting. Check computer's setup parameters using your system's setup utility.

Cannot Allocate Memory For Catalog Version Information

You will have to free at least 512KByte of memory before trying again. Choose cancel and continue.

Cannot Allocate Memory For Directory Index Buffers

Backup requires 512 KBytes of internal memory. You will have to free more memory and try again. Choose Cancel and continue.

Cannot Create File In The Installed Directory

This error could be the result of a lack of disk space or a network accessibility problem. Choose cancel and continue.

Cannot Create SLT Path or File

There is not enough room to create the file that holds your keyboard and mouse selections. Check your hard disk to see whether it is full or whether there is a network conflict. Choose cancel and continue.

Cannot Create the Setup File...c :\ DOSBACK\ MYDOCS.SET

This error could be the result of the following problems:

- (a) You might have a full hard disk.
- (b) You might have exceeded the root directory file limit (512).
- (c) You might not have the network authority to access the file.
- (d) Your path might be incorrect.

Cannot Find an Entry In Setup File

Your setup file is missing an option setting. Choose Cancel and continue. You will have to delete this setup file before you restart the Backup program.

Cannot Open Catalog File

You should check to see whether you have a network conflict. Choose Cancel and continue.

Cannot Open Setup File :WP51.SET

Ensure that your setup file is not read-only or that it is a network file for which you do not have write access. Choose cancel and continue.

Cannot Chdir To Path

CHKDSK cannot locate the start of the root directory. Reboot the computer and re-invoke the command. If the problem continues, you may need to reformat the hard disk.

Cannot Find System Files

You have attempted to load the operating system from a drive that does not contain system files. Use the SYS command to copy the system files to the drive and restore backup copies of CONFIG.SYS and AUTOEXEC.BAT to the root directory if necessary. If you cannot restore the system files, boot from a floppy disk, backup your data, and reformat the disk using the FORMAT/S command.

Cannot Load Command, System Halted

An application has overwritten all or part of COMMAND.COM in memory, and DOS is unable to reload the command processor. Reboot the computer, using the F8 function key if necessary. Check the integrity of the data modified by the application program. If necessary, copy COMMAND.COM to another directory and set the COMSPEC variable to that directory in AUTOEXEC.BAT.

Cannot Open Specifled Country Information File

You may have used an invalid file name for country code page in CONFIG.SYS. If you see this message at startup, check the syntax of the COUNTRY command in CONFIG.SYS, as well as the NLSFUNC, KEYB, and MODE commands in AUTOEXE.BAT .

Cannot Perfrom A Cycllc Copy

You tried to copy files into themselves. This can happen when you use XCOPY with the /S option and are attempting to copy to a subdirectory nested below the

source subdirectory. Correct the syntax and try again.

Cannot Read File Allocation Table

The file allocation table is corrupt. If you can still find some of your data, back up whatever you can find onto blank diskettes. Do not overwrite any previous back-ups. You may be able to repair the file allocation table using the CHKDSK command. If necessary, reformat the disk. If the problem occurs repeatedly, have the drive serviced or replaced.

Cannot Setup Expanded Memory

EMM386.EXE cannot initialize properly. Check the syntax of the initialization line in CONFIG.SYS. Be certain that HIMEM.SYS is installed before the memory manager. If necessary, have your system memory tested and serviced.

Catalog file: Catalog Name Is Missing!

Backup is unable to locate one of the Incremental or Differential catalogs listed in the master catalog that you are using for selection of files to be restored. You should note the missing catalog name and either retrieve or rebuild the catalog from the original backup set. Choose cancel and continue.

Catalog File Count Is Corrupt

Backup has determined that this file is corrupt. You should still be able to compare or restore files from this backup set, however. Catalog files can be retrieved or rebuilt from the backup set, and compares and restores can be performed without a catalog. Choose cancel and continue.

Code Page Drive Cannot Be Initialized

You may have included an invalid parameter in the code page driver initialization line. Edit CONFIG.SYS and correct the syntax, then reboot the computer.

Code Page Not Prepared

You have referenced a code page number that was not previously prepared using the MODE command.

Code Page Mismatch

You have referenced an unknown code page or keyboard ID number, or used an

invalid combination. Correct the command syntax and try again.

Convert Lost Chains To Files?

CHKDSK has discovered lost chains. Lost chains are areas of the disk that include data not assigned to files in the file allocation Table (FAT). Answer Y to this question if you would like to recover this disk space. CHKDSK will convert the lost chains to files, giving them the name FILEnnnnn.CHK, where *nnnnn* is a number from 0000 to 1000. You can review, edit, rename, or delete these files as you wish.

Current Drive is No Longer Valid

The currently logged drive does not have either a disk in it, or its door is open. In case of network the drive is unrecognizable. Change to another drive with a disk in it. Insert a disk in the drive and close the drive door.

Data Error

DOS 6 has detected inconsistencies in data while reading or writing a file. You are prompted to Abort or Retry the operation. Press R (Retry) a few times, but if the message persists, press A (Abort). Check the disk using the CHKDSK command. Make fresh backups of the data (do not overwrite current backups) and reformat the disk. If the problem persists or occurs on several disks, your drive is bad. Use a cleaning floppy or service the drive.

Directory Already Exists

When you attempt to create a directory using the MD or MKDIR commands, a directory of the same name already exists on your system and then this message appears. Use a different name of the directory or sub-directory.

DOSFILE SET Entry File Not Found

The setup file you specified cannot be found. Choose Cancel and then Exit Program to continue.

Drive or Diskette Types Not Compatible

When you use the DISKCOMP or DISKCOPY commands on drives with two different format types like 1.2 M Byte and 360 KBytes, then this message appears. Use the FC or XCOPY command in place of DISKCOMP or DISKCOPY commands.

Diskette Bad or Incompatible

When you are using a floppy disk that has an incorrect format or it is copy-protected, or contains data errors then such a message appears. Use the CHKDSK command to correct the problem.

Disk Boot Failure

Disk boot record is possibly corrupt. You should boot from 'A' drive using System disk (containing your IO.SYS, MSDOS.SYS and COMMAND.COM files), and then type `sys c:` again. Note the gap between SYS and C:.

Disk Error Writing FAT

DOS file allocation table is likely to be corrupt. Use Norton Disk Doctor program to repair it. If that doesn't work, you will have to reformat the hard disk. Note that Norton Disk Doctor is not part of DOS 6 or 6.2.

Divider Overflow

This error is caused mainly due to a bug in an application program. Debug the program, or use another copy of that program.

Duplicate File Name

If you try to rename a file to the name of file existing, then this message comes. Use a different file name.

Error In Exe File

The program EXE file contains errors that interfere with running of the program. It may be due to incompatible with the version of DOS. Load a new DOS version. Copy a new executable file from backup copies or the master disk.

Error Loading Operating System

The operating system files i.e. Command.Com. etc. cannot be found or have become corrupted in the booting disk. Use the SYS command to copy the system files to the drive or use another booting disk. If you cannot restore the system files in the hard disk, boot from a floppy disk, backup your data, and reformat the hard disk using the FORMAT/S command. Be very careful while formatting the hard disk.

Error Reading Directory

The file allocation table or subdirectory has become corrupted. Back up whatever data you can take on blank diskettes; use *Norton Disk Manager* program to correct the File Allocation Table. If the problem persists, reformat the hard disk. Norton DISK Manager is a separate program which is not part of DOS 6 or DOS 6.2.

Error Reading System File

One of the operating system files has become corrupted. Back up your data, if possible. Restart your system. Reinstall operating system by using *sys* command.

Error Reading (or Writing) to Device

The peripheral device like printer does not accept data being sent to it by the computer, or DOS was unable to process data sent from the device. Check that the device is *on line*, that the baud rate at which you are sending data is not too high, and that the data being sent is appropriate for the device. For example, send data at 9600 baud only if the device can process at 9600 baud. Also do not send binary files to a device that can accept only ASCII files.

Error Reading (or Writing) Drive

This message indicates a damaged floppy disk in the drive. Try another floppy disk. If the problem continues, have the drive cleaned or realigned from a service centre.

Error Reading Partition Table

The hard disk's partition table is unusable. Use FDISK to set up the partition table before attempting to format the disk. If this problem persists, reformat the hard disk using *Disk Manager* so that you can do low level formatting. Disk Manager is a separate software which is not included in DOS 6 or DOS 6.2.

Error Sending File To Remote System

This problem typically occurs when the validation algorithm computed value on the remote file doesn't match that of the sending file. Try retransmitting the file. Also make sure that your remote computer is turned on.

Error writing setup file C :\DOSBACK \Doc.set

You might have a full hard disk, or you might have a hardware problem. Choose

cancel and continue.

Exec Failure

The application's executable file contains errors that interfere with the working of DOS. The file may be incompatible with your current version of DOS. Use another DOS version. Copy a new executable file from backup or master disk. Increase the number of open files by changing the FILES command in CONFIG.SYS, and reboot the computer.

Expanded Memory Manager Not Present

You must install the expanded manager before installing drivers that require this memory. Move the expanded memory manager initialization line to an earlier position in the CONFIG.SYS file.

Expanded Memory Status Shows Error

The driver has detected an error in your expanded memory manager. Consult the DOS 6 manual for your expanded memory manager to solve the problem. Check the EMM386.EXE file.

Extended Memory Manager Not Present

You must install the XMS extended memory manager HIMEM.SYS before installing drivers that require this memory, such as EMM386.EXE. Move the HIMEM.SYS initialization line to an earlier position in the CONFIG.SYS file.

Fail On Int 24

DOS has come across a critical error during processing. A mechanical drive failure or corrupted file may halt the system altogether. You can delete the files that cause the problem, or have the drive serviced.

FCB Unavailable

DOS is asked to access a file control block that is not within its range. Edit the CONFIG.SYS file to change FCB (*FCB stands for File Control Block*) command.

File Allocation Table Bad

The file allocation table (FAT) has gone bad. Back up your data on blank diskettes. Do not overwrite previous backups. You may solve the problem by

invoking the CHKDSK command. If the problem persists, get the disk drive or hard disk repaired.

File Cannot Be Copied Onto Itself

You have specified the same file as both the source and target. Change the file specification for the source or target as necessary, and give the command again.

File Creation Error

This message can come due to one of the following:

- (a) There was not enough space on the disk or chosen sub-directory for the file you tried to create.
- (b) The file you tried to create already exists and is read-only.
- (c) You tried to rename a file using a file name that already exists.
- (d) You attempted to redirect output to an invalid filename.

If the file is on the root directory, check that the maximum number of root directory files (512) has not been reached. If the root directory (or entire disk) is full, delete some other files preferably *.BAK files. If the file in question is read-only, use a different target name, a different directory location, or use the ATTRIB command to remove the read-only attribute. If you are renaming files, use a different target name or location.

File Is Cross-Linked

CHKDSK has found two files that share the same area of the disk. If you have specified the /F option, the named file is truncated to remove the discrepancy.

File Not Found

The requested file was not found on the currently logged directory or any of the directories specified with the PATH or APPEND commands. Check the file name for correct spelling and correct location. If necessary, change the search path.

General Failure

The disk in the drive was not formatted or was formatted for a system other than DOS. Reformat the disk. If the problem continues, have the drive serviced.

I/O Error

DOS has discovered a RAM error while processing. Check the status of all

memory-resident applications for conflict with the current application.

Incompatible Configuration File Version

The configuration file MSBACKUP.INI in which Backup stores your system configuration and personal preferences is not the correct version. If you want to reconfigure now, choose Reconfigure (press Enter), and if you want to exit Backup, press Esc.

Incompatible Switches

You have used mutually-exclusive options on the command line in the Autoexec.bat file. Check the Batch file.

Incorrect DOS Version

You entered a DOS external command for a version that is different from the DOS version currently in RAM. Reboot with the correct version of DOS, or use the correct executable file for the command.

Incorrect Number of Parameters

See the "Invalid parameter" error message entry.

Insufficient Disk Space

The available space on your disk for copying or creating files is not enough. Run CHKDSK to reclaim space that may be occupied by lost clusters. Other wise delete some files.

Insufficient Memory

RAM (main memory) is not sufficient to process the command you entered. Remove some memory-resident files. Reboot the computer if necessary or change the config. sys file.

Insufficient Disk Space Available for Restore/ Capture Process

You need to free approximately 100 kByte of hard disk space. Choose cancel and continue.

Insufficient Disk Space for Log File

You need to free approximately 100 kByte of hard disk space. Choose cancel and continue.

Insufficient Disk Space to Create Catalog.

Your hard disk needs about 100 kByte of available space. choose cancel and continue .

Insufficient Disk Space to Save Backup Selections

Your hard disk needs about 100 kByte of available space for the SETUP.SLT file, which holds previously entered directory and file selections. Choose cancel and continue.

Insufficient Disk Space to Save Setup File

You will have to provide about 100 kByte of available space. Choose cancel and continue.

Insufficient Memory For Catalog Buffer

You will have to free at least 512 kByte of memory before trying again. Choose Cancel and continue.

Insufficient Memory For Catalog Merging Buffers

There is not enough memory available for merging multiple catalogs using a master catalog. You will either have to free more memory or restore or compare individual backup sets to individual catalogs. Choose cancel and continue.

Insufficient Memory For Catalog Processing

You will have to free more memory before trying again. Choose cancel and continue.

Insufficient Memory For Directory Log

There is not enough memory to contain the largest directory's list of contents. You will need to either free more memory or divide the largest directory into two or more smaller directories.

Insufficient Memory For Merged DIR Information

You will have to free at least 512 kByte of memory before trying again. You might have to compare or restore each backup set individually in lieu of utilizing the merged catalog. Choose Cancel and continue.

Insufficient Memory Or Disk Space To Rebuild /Retrieve

There is either insufficient memory available to load the catalog processing program or insufficient disk space to create a temporary file. If you have at least 500 kByte disk space available, the problem is probably memory. Choose cancel and continue.

Insufficient Memory to Continue Backup.Backup Requires 512KB Memory

You will have to free more memory and try again. Choose cancel and continue.

Insuffclent Memory To Load Directory Information.

You will have to free at least 512 KBytes of memory before trying again. Choose Cancel and continue.

Insufficient Memory To Log Selected Drive

You will have to free at least 512 KBytes of memory before trying again. Choose cancel and continue.

Insufflcient Memory To Process Setup File

There is not enough memory to hold your keyboard and mouse settings. Choose cancel and continue.

Insufficient Memory To Process The Directory Index

There is not enough memory to process the directory index within the catalog. You will have to free more memory and try again. Choose cancel and continue.

Insufficient Memory To Read Setup File

You will have to free at least 512 KBytes of memory before trying again. Choose Cancel and Exit Program to continue.

Insufficient Memory To Save Dir Information

You will have to free at least 512 KBytes of memory before trying again. Choose Cancel and continue.

Insufficient Memory To Verify Catalog Checksums

You will have to free at least 512 KByte of memory before trying again. The checksums are used to verify the integrity of the catalogs. Choose cancel and continue.

Internal Error

A technical error has occurred in the system. Reboot the computer. If you detect a pattern to the appearance of the error, restore the problem application or DOS file from backup or re-install the file from master disks and try it again. Do not overwrite current backups with new backups after seeing this message until the problem is solved.

Internal Stack Overflow

Either DOS or the application program finds an overflow condition in the stack space. Edit CONFIG.SYS file and increase the STACK size to an appropriate value.

Invalid Allocation Unit

The file allocation table is indicating an invalid disk location for a file. If you specified the /F parameter while using CHKDSK command, the file size is changed to zero bytes and the data is lost.

Invalid Code Page

You have referenced an unknown code page number. Correct the command syntax and try again. Refer to the NLSFUNC and MODE commands as well as the COUNTRY command regarding code pages.

Invalid COMMAND.COM

An application or power spike/drop has damaged COMMAND.COM file. Insert your DOS 6 System disk in drive A and reeboot, and copy the COMMAND.COM file to hard disk, using sys command.

Invalid Environment

You have specified an environment size in your CONFIG.SYS file that isn't between 160 and 32,768 bytes. Check your /E option on the COMMAND.COM command line.

Invalid Partition Table, Bad Partition Table, Error Reading Partition Table, Non-Standard, Missing, or Bad Partition Table, or Disk Unsuitable

These errors indicate that you should run the UNFORMAT program with the /PARTN switch included. This will rebuild your partition table. To be assured that your partition table will be rebuilt accurately and with the most current state, you should have the MIRROR/PARTN command line included in the AUTOEXEC.BAT file

Invalid Date

DOS cannot recognize the date format you have entered, or you have entered a non-existent date. Check your entry and try again.

Invalid Directory

You have entered an invalid directory name or the name of a directory that does not exist. Check the spelling of the directory name and re-enter it.

Invalid Disk Change

DOS has discovered that you have changed disks during processing. Return the original disk to the drive. If disks have not been changed, this message may signal a hardware problem.

Invalid Drive Specification

You have entered the letter of a drive that does not exist. Enter a different drive letter or assign the drive letter using the ASSIGN or SUBST command.

Invalid Device Request

DOS was unable to process a device driver command. Check the configuration syntax for the driver file and try again. If the syntax is correct, this message may indicate a corrupted device driver file or hardware failure. Recopy the driver file and try again. If necessary, have your system serviced.

Invalid Drive in Search Path

You have referenced a drive letter in the PATH command that is out of range on your system. Edit the PATH command syntax or the LASTDRIVE command in CONFIG.SYS.

Invalid Filename

You have entered a file name containing invalid or wildcard characters, or you have used a reserved device name as a file name. Try the command again using a different file specification.

Invalid Handle

An application has attempted to access a file handle that is out of range. Contact technical support for the application that was running when you received this message.

Invalid Parameter

You have specified incorrect option switches on the command line, or have combined parameters illegally. Review the syntax of the command and try it again.

Invalid Partition Table

DOS 6 has detected an error in the hard disk's partition information. Back up whatever data you can and run FDISK to initialize a valid partition table.

Invalid Path

You invoked the RD or RMDIR commands using the name of the currently logged directory. Log onto the parent directory and try again. You cannot remove the root directory.

Invalid Path, Not Directory, or Directory Not Empty

DOS is not able to locate the specified directory, or you entered a file in place of a directory name or the directory contains files (or other nested subdirectories) and cannot be removed. Check the spelling of the directory name or list the contents of the directory. If it appears empty, it may contain hidden files. Use the DIR/A:H command to reveal any possible hidden files.

Invalid Syntax

DOS could not process the syntax you entered. Review the correct command syntax and try again.

Invalid Switch

A switch specified in your command is not available with the current command. This message is also caused when you use a forward slash(/) rather than a backslash (\) in directory names.

Maximum Subdirectories Per Drive Reached

Backup has a limit of 1,023 subdirectories per drive. You will need to divide your drive into two logical drives, or combine some of your directories before backing up your drive.

Memory Allocation Error

DOS 6 or DOS 6.2 was not able to configure RAM as per your config.sys file properly. Reboot the computer. If the problem does not go away, reboot from a floppy disk and use the SYS command to copy new system files onto your hard disk. If the problem persists, have your computer's memory boards serviced.

Invalid Signature - Checksum Does Not Match

A signature uniquely identifies a virus . If the virus signature you enter when updating the Virus List has an error in it, you will receive this message. To correct the signature, check the signature code for accuracy and completeness, correct the codes, and choose OK.

Missing Operating System

Your operating system file IO.SYS or MSDOS.SYS or both, are corrupt. Boot the System with system disk in drive A, and type SYS c:. Note the gap between the word SYS and C:.

Nlsfunc Not Installed

You have attempted to reference code pages for international character sets prior to invoking the NLSFUNC command. Invoke NLSFUNC and try again.

No Extended Memory Available

The XMS extended memory has been allocated to other applications and resident functions. Deactivate other drivers to make room for your RAM disk.

No Fixed Disks Present

DOS 6 was not able to detect the presence of a hard disk drive. Check your computer's setup parameters for the correct drive type. If necessary, perform a low-level format and repartition the disk drive, using *Disk Manager*. Disk Manager is not part of DOS 6 or DOS 6.2.

No Subdirectories Exist

You ran the TREE command from a directory that has no subdirectories. Type the command CD \ to access the root directory, and then retry the TREE command.

No Free File Handles

Increase the size parameter in the FILES = statement in the CONFIG.SYS file, and reboot the system.

No Room For New Catalog Name

You are exceeding the maximum of 26 backups a day of the same drives using the same backup type. Choose cancel and continue.

Non-System Disk Or Disk Error

DOS 6 cannot find system files on the current disk. Insert a disk containing system files or boot from the hard disk if it contains system files.

Not Enough Memory

See the "Insufficient memory" error message entry.

Out Of Environment Space

You can increase the environment space by using the /E option on the COMMAND.COM command line in your CONFIG.SYS file.

Only The First 49 Setup File In This Directory Can Be Listed

You are trying to exceed the maximum of 49 files that can be listed in the setup

Files list box. Either delete some of your files or move them to a different directory. Choose cancel and continue.

Out Of Memory

Backup is unable to continue due to lack of available memory. You will have to free at least 512 KBytes of memory before trying again. Choose Cancel and continue.

Packed File Is Corrupt

A program is attempting to load into the first 64 kBytes of memory. Run LOADFIX.COM to circumvent this problem.

Path Not Found

The path you specified in the command does not exist on your current disk. For example, you entered a command such as copy C:\SALES*. *A:, but your hard disk does not have a directory named SALES.

Parse Error

You have entered a syntax error, but DOS 6 cannot locate COMMAND.COM to display a more precise error message. Reboot the computer if necessary. Check the command syntax and try again.

Printer Error

DOS 6 cannot send data to your printing device. Make sure the device is on-line, has paper ready, and that the output has not been redirected to a different port.

Program Is Trying To Modify System Memory

This message displays when a program tries to modify the system memory without using the standard MS-DOS calls for TSR programs. Modifying system memory this way generally indicates that a virus is attempting to infect the system. This is an added safety measure to ensure that no virus is present. If you know that a network program is being loaded after VSafe was loaded, choose *Continue*. If you don't know what is causing the message, choose *Stop*, then run the anti-virus program to check for viruses.

Read Fault Error

DOS 6 cannot read data on the disk. Re-insert the disk in the drive and press R (Retry). If the error persists, run CHKDSK on the disk; if the disk is unrecoverable, reformat or discard it.

Required Font Not Loaded

DISPLAY.SYS has not been initialized to include the desired font. Edit CONFIG.SYS, increasing the number of subfonts, and reboot the computer.

Resident Programs Were Loaded After Vsafe

VSafe displays this message if you try to remove VSafe from memory. Choose Stop to leave VSafe resident in memory. Since a virus was detected, rebooting is recommended to minimize the possibility of further infection. Choose reboot to restart your system after a virus is detected.

Sector Not Found or General Failure Reading Drive

This error will occur due to ageing of a hard disk. You should run a low-level format utility like Disk Manager on your disk. If still does not work, replace the hard disk. Disk Manager is not part of DOS 6 or DOS 6.2.

Required Parameter Missing

You tried to use a command without specifying a parameter. Try again, but include the required parameter.

Seek Error

See the 'Read fault error' error message entry.

Setup File MYWORK.SET Was Not Found

The setup file you specified in the Open Setup File dialog box was not found by Backup. This error could have resulted because you don't have network authorization to use the file, the file doesn't exist, or a hardware problem exists. Choose Cancel and continue.

Sharing Violation

You have attempted to reopen or write to a file that is already open. This occurs on a network, but may also occur on single-user systems with SHARE installed.

Use your current application's commands to close the data file before attempting to reopen or write new data to it.

Source Does Not Contain Backup Files

DOS 6 was unable to locate the file CONTROL.001 and BACKUP.001 on the floppy disk. Check the disk and try again.

Specified Command Search Directory Bad

The SHELL command in CONFIG.SYS contains invalid information. Edit this line in the CONFIG.SYS file and reboot the computer.

Syntax Error

You used the wrong format when you typed a command. This problem typically occurs within batch program commands. Review your batch program command lines carefully.

Terminate Batch Job (Y/N). Cannot Execute

COMMAND.COM is informing you that you have a fatal error in your batch program. Review your batch commands.

The password you entered doesn't verify

Back up doesn't recognize what you entered. Remember that the password check is case-sensitive. Choose Cancel and continue.

The xxxxxx virus is Known To Infect DATA Files as well as Executable Files

This message is displayed if you have not checked All Files option and a virus is detected. You should check all the files on this disk.

Too Many Open Files

You have exceeded the maximum number of allowed open files on your system. Increase the maximum number with the FILES command in CONFIG.SYS and reboot the computer.

Top Level Process Aborted, Cannot Continue

DOS 6 was unable to return to the parent program. Reboot the computer. Recopy the application files from backup or master disks. If using a batch file, edit the

syntax for nested subroutines.

Track Zero Bad

DOS has detected disk errors in a critical portion of the disk. Reboot the computer and try accessing the disk again.

Unable to Create Directory

You have attempted to create a directory using the MD or MKDIR commands, but either a directory of the same name is already on your system, or you have reached the limit on the number of entries in your root directory. Use a different name or try to create the directory at another nesting level.

Unrecognized Command In Config.sys

DOS 6 could not recognize a command in the CONFIG.SYS file when booting. Other messages that appear before this one may help you determine which lines are invalid. Edit CONFIG.SYS file and correct the invalid lines. If you are editing CONFIG.SYS with a word processor, be sure that you save the file as an ASCII code.

Unrecoverable Error In Directory, Convert Directory To File (Y/N)?

CHKDSK is informing you that your directory structure is corrupt. If you have a current system backup, answer no, delete the directory, and restore. If you do not have a current system backup, answer yes and use software like Norton Disk Doctor or PC Tools to repair the directory. Norton Disk Doctor or PC Tools are not part of DOS 6.

Unrecoverable Read or Write Error

DOS 6 could not read or write data to the disk. The disk is probably damaged. Use a different disk to save the current data. Run CHKDSK on the damaged disk to attempt to recover what files you can. Reformat or discard the bad disk.

Version Mismatch Between MSBACKUP. EXE And MSBACKUP.OVL

Backup has detected different versions of itself in its directory. You must ensure that all Backup program files have the same date and time stamps. If you are unable to correct the problem by reviewing the directory listing, you should reinstall using the DOS 6 or DOS 6.2 Setup Distribution diskettes. Choose Cancel and then choose Exit Program.

Virus Found

You have several options at this point. You can choose *Clean* to clean the virus from the file and restore it to its original condition. Choose *Continue* to ignore the virus and continue scanning. Choose *Stop* to stop the scan and return to the Anti-Virus program. Or choose *Delete* to erase the file from your system.

Verify Error

This error message might be the result of an intentional change you made. If you know you changed the file, you can choose *Update* to register the change. Information displayed includes the attribute assigned to the file, time, date, and size of file, and checksum. You have the following options:

If the attribute, time, or date has changed, choose *Repair* to return the file to its original condition.

If you know that the change is legitimate, choose *Update* to avoid receiving this message again during subsequent scans.

Choose *Continue* if you know about the change and you don't want to update the anti-virus program.

Choose Stop To Abort The Scan

File was destroyed by the virus !!! Recovery for this file is impossible. Delete this file in order to prevent further infection and damage?

If a file is destroyed by a virus, you can choose *Delete* to delete the infected file from the system, choose *Continue* to ignore the situation, or choose *Stop* to stop the scanning process

Warning! Invalid Parameter Ignored

DOS 6 cannot recognize a parameter you have entered on the HIMEM initialization line in CONFIG.SYS. Edit this line in the CONFIG.SYS file and reboot the computer.

Warning! No Files Were Found to Restore

Your file specification did not match files on the backup floppy disk. Log onto the target subdirectory before invoking the command. Review the command syntax carefully, and re enter the command with the correct file path specification for the hard disk.

Write Fault Error

You may have to take one of the following two actions:

- (a) DOS 6 cannot write data to the disk. Re-insert the disk in the drive, and press R(Retry). If the error persists, run CHKDSK on the disk; if the disk is unrecoverable, discard it.
- (b) You attempted to send data to your printer, and it is either disconnected or not in a ready state. Check your cabling and the ready indicator on your printer.

Write Protect Error

DOS cannot write data to the disk because it is write-protected. Remove the write-protection tab from the disk, re-insert the disk in the drive, and press R (Retry). If the error persists, use a different disk.

Appendix B

DOS 6 & 6.2 REFERENCE CARD (IMPORTANT COMMANDS)

Command	Purpose
ANSI.SYS	Defines functions that change display graphics, control cursor movement, and reassign keys. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
append	Enables programs to open data files in specified directories as if the files were in the current directory. Do not use this command when you are running Windows.
attrib	Displays or changes file attributes.
break	Sets or clears extended CTRL+C checking. You can use this command at the command prompt or in your CONFIG.SYS file.
buffers	Allocates memory for a specified number of disk buffers when your computer starts. You can use this command only in your CONFIG.SYS file
call	Calls one batch program from another without causing the first batch program to stop.
cd	Displays the name of the current directory or changes the current directory.
chep	Displays the number of the active character set (code page). You can also use this command to change the active character set for all devices that support character-set switching.
chdir	See the cd command.
chkdsk	Checks the status of a disk and displays a status report. Can also fix disk errors. Do not use chkdsk with the /f switch when you are running Windows.

Command	Purpose
choice	Prompts the user to make a choice in a batch program. Displays a specified prompt and pauses for the user to choose from among a specified set of keys. This command is useful only in batch programs.
cls	Clears the screen.
command	Starts a new instance of the MS-DOS command interpreter.
copy	Copies one or more files to the location you specify.
country	Enables MS-DOS to use country-specific conventions for displaying dates, times, and currency; for determining the order by which characters are sorted; and for determining which characters can be used in filename. You can use this command only in your CONFIG.SYS file.
ctty	Changes the terminal device used to control your computer.
date	Displays the date and prompts you to change the date if necessary.
dblspace	Starts the Double-space program, which sets up or configures compressed drives. You cannot use this command when you are running Windows.
DBLSPACE.SYS	Moves DBLSPACE.BIN to its final location in memory. (DBLSPACE.BIN is the portion of MS-DOS that provides access to compressed drives.)
debug	Starts the Debug program, which you can use to test and debug executable files.
defrag	Reorganizes the files on a disk to optimize disk performance. Do not use this command when you are running Windows.
del (erase)	Deletes the files you specify.
deloldos	Deletes the OLD_DOS.1 directory and the files it contains from your hard disk. If you have more than one OLD_DOS directory, the command deletes all OLD_DOS directories and their files.
deltree	Deletes a directory and all the files and subdirectories that are in it.

Command	Purpose
device	Loads the device driver you specify into memory. You can use this command only in your CONFIG.SYS file.
devicehigh	Loads the device driver you specify into upper memory. You can use this command only in your CONFIG.SYS file.
dir	Displays a list of the files and subdirectories that are in the directory you specify.
diskcomp	Compares the contents of two floppy disks.
diskcopy	Copies the entire contents of one floppy disk to another floppy disk.
DISPLAY.SYS	Enables you to display international character sets on EGA, VGA, and LCD monitors. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
dos	Specifies that MS-DOS should maintain a link to the upper memory area, load part of itself into the high memory area (HMA), or both. You can use this command only in your CONFIG.SYS file.
doskey	Loads the Doskey program into memory. The Doskey program recalls MS-DOS commands and enables you to edit lines and create and run macros.
dosshell	Starts MS-DOS Shell, a graphical interface for MS-DOS.
DRIVER.SYS	Creates a logical drive that you can use to refer to a physical floppy disk drive. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
drivparm	Defines parameters for devices such as disk and tape drives when you start MS-DOS. You can use this command only in your CONFIG.SYS file.
echo	Displays or hides the text in batch programs when the program is running. Also indicates whether the command-echoing feature is on or off.
edit	Starts MS-DOS Editor, a text editor you can use to create and edit ASCII text files.

Command	Purpose
exit	Quits the MS-DOS command interpreter (COMMAND.COM) and returns to the program that started the command interpreter, if one exists.
EGA.SYS	Saves and restores the display when the MS-DOS Shell Task Swapper is used with EGA monitors. This device driver must be loaded by a device or deviceHigh command in your CONFIG.SYS file.
emm386	Enables or disables EMM386 expanded-memory support on a computer with an 80386 or higher processor. Do not use this command when you are running Windows.
EMM386.EXE	Provides access to the upper memory area and uses extended memory to simulate expanded memory. This device driver must be loaded by a device command in your CONFIG.SYS file and can be used only on computers with an 80386 or higher processor.
erase	Erases the files you specify.
expand	Decompresses a compressed file.
fasthelp	Displays a list of all MS-DOS commands and gives a brief explanation of each.
fastopen	Starts the Fastopen program, which improves performance on computers with large directories. Fastopen decreases the amount of time that MS-DOS takes to open frequently used files. Do not use this command when you are running Windows.
fc	Compares two files and displays the differences between them.
fcbs	Specifies the number of file control blocks (FCBs) that MS-DOS can have open at the same time. You can use this command only in your CONFIG.SYS files.
fdisk	Starts the Fdisk program, which configures a hard disk for use with MS-DOS.
files	Specifies the number of files that MS-DOS can access at one time. You can use this command only in your CONFIG.SYS file.
find	Searches for a specific string of text in a file or files.

Command	Purpose
for	Runs a specified command for each file in a set of files. You can use this command in batch programs or at the command prompt.
format	Formats a disk for use with MS-DOS.
Goto	Directs MS-DOS to a line in a batch program that is marked by a label you specify. You can use this command only in batch programs.
graphics	Loads a program into memory that enables MS-DOS to print the information displayed on your screen. Use the graphics command only if you are using a color or graphics adapter.
help	Starts MS-DOS help.
HIMEM.SYS	Manages the use of extended memory. This device driver must be loaded by a device command in your CONFIG.SYS file.
if	Performs conditional processing in batch programs. You can use this command only in batch programs.
include	Includes the contents of one configuration block within another. You can use this command only in your CONFIG.SYS file.
install	Loads a memory-resident program into memory. You can use this command only in your CONFIG.SYS file.
interlnk	Starts the Interlnk program, which connects two computers by means of parallel or serial ports and enables the computers to share disks and printer ports.
INTERLNK.EXE	Redirects commands on Interlnk drives and printer ports to drives and printer ports on the Interlnk server. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
intersvr	Starts the Interlnk server.
keyb	Starts the Keyb program, which configures a keyboard for a specific language.
label	Creates, changes, or deletes the volume label (name) of a disk.

Command	Purpose
lastdrive	Specifies the maximum number of drives you can access. You can use this command only in your CONFIG.SYS file.
Lh	See the loadhigh command.
loadfix	Ensures that a program is loaded above the first 64 kilobytes (K) of conventional memory.
loadhigh (Lh)	Loads a program into upper memory.
md	Creates a directory or subdirectory.
mem	Displays the amount of used and free memory on your computer.
memmaker	Starts the MemMaker program, which optimizes your computer's memory by configuring device drivers and memory-resident programs to run in the upper memory area. Do not use this command when you are running Windows.
menucolor	Sets the text and background colors for the startup menu. You can use this command only within a menu block in your CONFIG.SYS file.
menudefault	Specifies the default menu item on the startup menu and sets a time-out value if desired. You can use this command only within a menu block in your CONFIG.SYS file.
menuitem	Defines up to nine items on the startup menu. You can use this command only within a menu block in your CONFIG.SYS file.
mkdir	See the md command.
mode	Configures a printer, serial port, or display adapter; sets the typematic rate; redirects printer output from a parallel port to a serial port; prepares, selects, refreshes, or displays the numbers of the character sets (code pages) for parallel printers or the keyboard and screen; displays the status of all the devices installed on your computer.
more	Displays one screen of output at a time.
move	Moves one or more files to the location you specify. Can also be used to rename files and directories.

Command	Purpose
msav	Starts the Microsoft Anti-Virus program, which scans your computer for known viruses.
mscdex	Provides access to CD-ROM drives.
msbackup	Starts the Microsoft Backup program, which backs up or restores one or more files from one disk onto another.
msd	Starts the Microsoft Diagnostics program, which provides detailed technical information about your computer .
nlsfunc	Starts the Nlsfunc program, which loads country-specific information for national language support (NLS). Do not use this command when you are running Windows.
numlock	Specifies whether the NUMLOCK setting on your numeric keypad is set to ON or OFF. You can use this command only within a menu block in your CONFIG.SYS file.
path	Indicates which directories MS-DOS should search for executable files (programs).
pause	Suspends processing of a batch program and displays a message that prompts you to press any key to continue. You can use this command only within batch programs.
power	Turns power management on and off, reports the status of power management, and sets levels of power conservation.
POWER.EXE	Reduces power consumption when applications and devices are idle. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
print	Prints a text file.
prompt	Changes the appearance of the command prompt.
qbasic	Starts MS-DOS QBasic, a program that reads instructions written in the Basic computer language and interprets them into executable computer code (programs).

Command	Purpose
RAMDRIVE.SYS	Use part of Your computer's random-access memory (RAM) to simulate a hard disk drive. This device driver must be loaded by a device or devicehigh command in your CONFIG.SYS file.
rd	Deletes (removes) a directory.
rem	Enables you to include comments (remark) or prevent commands in a batch program or the CONFIG.SYS file from running.
ren	Changes the name of the file or files you specify.
rename	See the ren command.
replace	Replaces files in a destination directory with files in a source directory that have the same name.
restore	Restores files that were backed up by using the backup command from previous versions of MS-DOS.
rmdir	Removes a directory.
set	Displays, sets, or removes MS-DOS environment variables. You can use this command in your CONFIG.SYS file in addition to your AUTOEXEC.BAT file or at the command prompt.
setver	Displays the version table. Reports a version number (earlier than 6.0) to programs or device drivers that were designed for earlier versions of MS-DOS.
SETVER.EXE	Loads the MS-DOS version table into memory. This device driver must be loaded by a device or device-high command in your CONFIG.SYS file.
share	Starts the Share program, which installs file-sharing and locking capabilities on your disks and network drives.
shell	Specifies the name and location of the command interpreter you want MS-DOS to use. You can use this command only in your CONFIG.SYS file.
shift	Changes the position of replaceable parameters in a batch program. You can use this command only in batch programs.

Command	Purpose
smartdrv	When specified at the command prompt or in your AUTOEXEC.BAT file, creates a disk cache in extended memory. The cache speeds up access to your hard disk. Do not use this command when you are running Windows.
SMARTDRV.EXE	When loaded with a device command in your CONFIG.SYS file, this device driver provides compatibility for hard-disk controllers that cannot work with EMM386 and Microsoft Windows running in enhanced mode.
sort	Reads input, sorts data, and writes the results to the screen, a file, or another device.
stacks	Supports the dynamic use of data stacks to handle hardware interrupts. You can use this command only in your CONFIG.SYS file.
submenu	Defines an item on a startup menu that, when selected, displays another set of choices. You can use this command only within a menu block in your CONFIG.SYS file.
subst	Associates a path with a drive letter. Do not use this command when you are running Windows.
switches	Specifies special options in MS-DOS. This command can be used only in your CONFIG.SYS file.
sys	Creates a startup disk by copying hidden MS-DOS system files and the MS-DOS command interpreter (COMMAND.COM) to the disk.
time	Displays the system time or sets your computer's internal clock.
tree	Graphically displays the structure of a directory.
type	Displays the contents of a text file.
undelete	Restores files that were previously deleted by using the del command.
unformat	Restores a disk that erased by using the format command.
ver	Displays the MS-DOS version number.

Command	Purpose
verify	Directs MS-DOS to verify that your files are written correctly to a disk, and displays the status of verification. You can use this command either at the command prompt or in your CONFIG.SYS file.
vol	Displays the volume label and serial number for a disk, if the disk has them.
vsafe	Continuously monitors your computer for viruses and displays a warning when it finds one. Do not use this command when you are running Windows.
xcopy	Copies directories, their subdirectories, and files (except hidden and system files).

Appendix C

THE ASCII CHARACTERS

The ASCII characters and the extended ASCII characters are identified by the numbers 1 to 255. To use these characters, hold down Alt and type the corresponding number on the numeric keypad. Make sure that Num Lock is on when you press the Alt key and the corresponding number on the key pad. These characters are given in the table below.

STANDARD TEXT CHARACTERS

32		33	!	34	"	35	#	36	\$	37	%	38	&	39	'
40	(	41	)	42	*	43	+	44	,	45	-	46	.	47	/
48	0	49	1	50	2	51	3	52	4	53	5	54	6	55	7
56	8	57	9	58	:	59	;	60	<	61	=	62	>	63	?
64	@	65	A	66	B	67	C	68	D	69	E	70	F	71	G
72	H	73	I	74	J	75	K	76	L	77	M	78	N	79	O
80	P	81	Q	82	R	83	S	84	T	85	U	86	V	87	W
88	X	89	Y	90	Z	91	[	92	\	93	]	94	^	95	_
96	`	97	a	98	b	99	c	100	d	101	e	102	f	103	g
104	h	105	i	106	j	107	k	108	l	109	m	110	n	111	o
112	p	113	q	114	r	115	s	116	t	117	u	118	v	119	w
120	x	121	y	122	z	123	{	124		125	}	126	~	127	o

EXTENDED ASCII CHARACTERS

128	Ç	129	ü	130	é	131	â	132	ä	133	à	134	á	135	ç
136	ê	137	ë	138	è	139	í	140	î	141	ï	142	ä	143	Å
144	É	145	•	146	Æ	147	Ö	148	Ø	149	ò	150	û	151	ù
152	ý	153	ö	154	U	155	•	156	£	157	•	158	•	159	•
160	•	161	•	162	•	163	•	164	•	165	•	166	•	167	•
168	•	169	•	170	•	171	•	172	•	173	•	174	•	175	•
176	•	177	•	178	•	179	•	180	•	181	•	182	•	183	•
184	•	185	•	186	•	187	•	188	•	189	•	190	•	191	•
192	•	193	•	194	•	195	•	196	•	197	•	198	•	199	•
200	•	201	•	202	•	203	•	204	•	205	•	206	•	207	•
208	•	209	•	210	•	211	•	212	•	213	•	214	•	215	•
216	•	217	•	218	•	219	•	220	•	221	•	222	•	223	•
224	•	225	•	226	•	227	•	228	•	229	•	230	•	231	•
232	•	233	•	234	•	235	•	236	•	237	•	238	•	239	•
240	•	241	•	242	•	243	•	244	•	245	•	246	•	247	•
248	•	249	•	250	•	251	•	252	•	253	•	254	•	255	•

Fig. 1 The ASCII Character Set and Extended ASCII Character Set

Appendix D

KEYBOARD SCAN CODES

The following are scan codes generated by your keyboard each time you press a key. These codes can be interpreted by several programs, including the ANIS.SYS console driver to reassign keys on the keyboard.

GENERAL SCAN CODES

<i>Code</i>	<i>Key</i>	<i>Code</i>	<i>Key</i>
1	Escape	28	ENTER
2	1!	29	Control Key
3	2@	30	A
4	3#	31	S
5	4\$	32	D
6	5%	33	F
7	6^	34	G
8	7&	35	H
9	8*	36	J
10	9(	37	K
11	0)	38	L
12	-_	39	;;
13	=+	40	'''
14	Backspace	41	'~
15	Tab	42	Left shift key
16	Q	43	\ /
17	W	44	Z
18	E	45	X
19	R	46	C
20	T	47	V
21	Y	48	B
22	U	49	N
23	I	50	M
24	O	51	,
25	P	52	.
26	[{	53	/?
27	]}	54	Right Shift key

<i>Code</i>	<i>Key</i>	<i>Code</i>	<i>Key</i>
55	*print screen	72	Up arrow 8
56	Alt key	73	PgUp 9
57	Spacebar	74	-(keypad
58	caps lock		minus key)
59	F1	75	Left arrow 4
60	F2	76	5 (keypad only)
61	F3	77	Right arrow 6
62	F4	78	+ (keypad plus key
63	F5	79	End 1
64	F6	80	Down arrow 2
65	F7	81	Pg Dn 3
66	F8	82	Insert key
67	F9	83	Delete key
68	F10	84	Sys Rq
69	Num lock	87	F11
70	Scroll Lock	86	F12
71	Home 7 (keypad numbers only)		

FUNCTION KEY SCAN CODES

The extended scan codes for the function keys are as follows::

	Normal	Shifted	Control	Alt
F1	0;59	0;84	0;94	0;104
F2	0;60	0;85	0;95	0;105
F3	0;61	0;86	0;96	0;106
F4	0;62	0;87	0;97	0;107
F5	0;63	0;88	0;98	0;108
F6	0;64	0;89	0;99	0;109
F7	0;65	0;90	0;100	0;110
F8	0;66	0;91	0;101	0;111
F9	0;67	0;92	0;102	0;112
F10	0;68	0;93	0;103	0;113

EXTERNAL COMMANDS

APPEND

This command establishes a subdirectory search path for data files. When a data search path is set using APPEND, DOS will look in the currently logged subdirectory first followed by the subdirectories in the search path.

SYNTAX

First usage;

APPEND/E or /X

Subsequent usage;

APPEND source:\path; additional drive (s):\path(s)/switches

you may need to invoke APPEND twice; first to set the environment switches and second to specify the subdirectory search path for data files.

You may name any number of subdirectories in the search path, but you are limited to 127 character total (including 7 for the APPEND command and a space.) Each subdirectory in the search path must be named separately; nested subdirectories are not included automatically. Type a semicolon between each name in the search path.

If you invoke APPEND without parameters it will display the current data search path.

SWITCHES

/E

Stores the search path within the DOS environment space, in a variable named APPEND. The environment space must be large enough to accommodate the search path. This parameter is legal only the first time you invoke APPEND, before you use APPEND again to establish the

	search path.
/X:on	Allows executable files (*.EXE *.COM) to access the data search path. Using /X is the same as using /X: on. You can use this parameter any time when using APPEND.
/X:off	Cancels the ability of additional DOS external commands (such as FIND) to use the data search path.
/path:on	Use the data search path whether or not data file names include drive letters or subdirectories.
/path:off	Do not use the data search path if data file names include drive letters or subdirectories.
(semicolon)	Cancels the current data search path.

Examples

APPEND /E /X

Places the data search path in the DOS environment space rather than in normal RAM and indicates that other commands will use the data search path

APPEND C:\WORD;\WPDATA

Instructs DOS to look for data file in the C:\WORD subdirectory, and the \WPDATA subdirectory on the currently logged drive.

APPEND C:\WORD/path:off

Instructs DOS to look for data file of the C:\WORD subdirectory, except for data file that already includes a drive letter and/or a subdirectory path name.

APPEND

cancels the current data file search path.

ATTRIB

Files can be declared read-only, read-write, archived. In DOS 6 attributes of directories may also be changed.

SYNTAX

ATTRIB modes target drive:\path\file\(\s) /switches

ATTRIB requires a file name parameter. The file name may contain wildcard characters. If called without parameters, ATTRIB will display the attributes of all files matching the indicated file name.

SWITCHES

/S Used with file names that contain wildcard characters or subdirectory names without file names. This option will include matching files in subdirectories nested below the current subdirectory.

You cannot use more than one mode option at a time. The following mode options are used by ATTRIB:

- + R Changes specified file(s) to read-only which means the file(s) cannot be overwritten or erased
- R Changes specified file(s) to read write which means, the file may be overwritten or erased
- + A changes file setting(s) to archived
- A Changes file setting(s) to Not Archived
- + H Changes specified file(s) to hidden, which means the file(s) will not be visible to most DOS Operations.
- H Makes hidden file(s) visible again.
- + S Marks specified file(s) as DOS system file(s)
- S Removes DOS system-file setting.

Examples

ATTRIB ATTRIB.EXE

Will display the attributes of the file ATTRIB.EXE.

ATTRIB\ + R C:\DOS*.* /S

Will change all the files on the C:\DOS subdirectory, and subdirectories nested below \DOS, to read-only.

CHKDSK

CHKDSK examines the hard disk and reports certain common errors. The most common errors found by CHKDSK are lost clusters, cross-linking, and allocation errors.

SYNTAX

CHKDSK drive:\path\file(s) /switches

If you invoke CHKDSK without parameters, DOS will analyze the current default disk. If you invoke CHKDSK followed by another drive letter, CHKDSK will analyze that drive.

SWITCHES

/F Enables auto-correction mechanism. When lost clusters are found, the message displayed is:

nn lost clusters found in n chain. Convert lost clusters to files(Y/N)?

Where n is a number indication about the quantities involved. If you answer Y, the lost clusters are converted to files, giving them the name FILEnnnn.CHK where nnnn is a number from 0000 to 9999. You can review edit, rename or delete these files as you wish. If you answer N, the lost clusters are simply removed.

/V Displays the name of each file on disk as it checks. Because hard disk can contain hundreds of files. this option will often produce a long report you may wish to redirect the report to a file.

Examples

CHKDSK /F

Checks the current hard disk and attempts to fix any errors it finds.

CHKDSK D:\DOS*. *N > D:\STATUS.FIL

Checks the files on the D:\DOS subdirectory, displays the name of all the files of disk. and redirects the output to a file named D:\STATUS.FIL.

Notes CHKDSK reports logical errors in the file allocation table and directories. It dose not check for errors in the file.

DBLSPACE

Doubles the Hard Disk space for Storing Data.

SYNTAX

DBLSPACE /switches drive:

This command compresses data on a drive that you select. The process takes some amount of time. During the process, DBLSPACE re-starts your computer twice. After DBLSPACE has configured itself, you can invoke the DBLSPACE command to manage certain functions of your compressed drive.

SWITCHES

Drive:

/CHKDSK *drive*:
 /CHKDSK /F *drive*
 /COMPRESS *drive*:
 /COMPRESS
 /NEWDRIVE =
new : *drive*
 /CREATE *drive*
 /CREATE /SIZE=*n.nn*
drive
 /DEFRAGMENT *drive*
 /DELETE *drive*

Displays information about a drive.

Checks compressed disk for errors of *drive*.
 Fixes errors on compressed drive
 Compress an existing *drive*
 Compress an existing drive
 Where new is a new drive letter and drive; is the drive letter of the existing drive
 Create a new compressed *drive*
 Create a new compressed drive where *n.nn* is the new size and *drive* is an existing standard drive.
 Rewrite files on the compressed *drive* in contiguous sectors.
 Delete compressed *drive*. All files are lost.

/FORMAT <i>drive</i>	Reformat compressed <i>drive</i> . All files are lost.
/MAP	Display the characteristics of all drives.
/MAXCOM- PRESS <i>drive</i>	Allows increased compression of <i>drive</i> .
/MOUNT= <i>nnn</i>	Connects a compressed drive
/RATIO= <i>n.nn drive</i>	Assigns a new compression ratio to compressed <i>drive</i>
/SIZE= <i>n.nn drive</i> :	Changes the size of <i>drive</i> , where <i>n.nn</i> is the new drive size.
UNMOUNT <i>drive</i>	Disconnects <i>drive</i> from the compressed volume file.

Examples

DBLSPACE /COMPRESS D:

changes existing D: drive to a compressed drive using default size and compression ratio.

DBLSPACE /UNMOUNT A:

disconnects the compressed floppy drive in drive A.

DEFRAG

This command speeds up disk performance by reorganizing files.

SYNTAX

DEFRAG *drive*: /switches

DEFRAG optimizes disk performance by rearranging the fragmented files in contiguous sectors. This makes file reading faster and saves wear and tear on a hard disk moving parts.

SWITCHES

/F Arranges defragmented files so that there are no empty spaces between them.

/U	Does not reallocate defragmented files.
/S:order	Sorts the files in their directories, according to the value of <i>order</i> . When you use more than one character, files are sorted first according to the leftmost characters then characters to the right determine the order within duplicates.
/B	Restarts the computer after defragmentation.
/V	Verifies that the defragmented files match the original file image in memory.

Example

```
DEFRAG C:/F /S:EDS
```

defragments files and sorts them on disk so that no empty space fall between them. Further, it arranges them in directories by extensions, within duplicate extensions by date and time, and when date and time are the same, by size.

Error Level Codes

The codes indicate the difficulty encountered while defragmenting hard disk.

- 0 = defragmentation completed successfully
- 1 = Internal error detected while running DEFRAG
- 2 = Disk full (No free clusters)
- 3 = Operator interrupted comparison with Ctrl-C
- 4 = General disk failure
- 5 = Errors found reading clusters
- 6 = Error found writing clusters
- 7 = File allocation error (Run Chkdsk/F)
- 8 = Memory error
- 9 = Insufficient RAM

DELTREE

This command removes a directory, file and subdirectories.

SYNTAX

DELTREE /switch drive:\path

Use the DELTREE command to quickly remove an unwanted directory plus all files on it, and all subdirectories nested below it, using a single command.

SWITCH

/Y Suppresses the prompt that asks you to confirm that you want to delete the directory.

Example

DELTREE C:\XYZ

prompts for confirmation and, if you enter Y, deletes the \XYZ directory and all files in this directory.

DISKCOMP

Compares the contents of the two floppy disks on a track-by-track basis, reporting which track numbers are not identical.

SYNTAX

DISCOMP source : target:/switches.

DISKCOMP requires that you enter a source drive. This drive must be a drive letter for a floppy disk drive. If you do not specify a second drive for comparison, DOS uses the current default drive for the second drive.

If the source drive and the second drive are the same, DOS first reads the floppy disk in the source drive then prompts you to remove the disk and insert

the second disk into the same drive. You may have to switch disks more than once to complete the comparison processes specially when the disks are of the capacity 1.2 M Byte or more.

SWITCHES

- /1 Instructs DISKCOMP to compare only the first side of each track, even for double-sided disks.
- /8 Instructs DISKCOMP to compare only the first 8 sectors of each track even if the tracks have 9 or 15 sectors.

Examples

DISKCOMP A:

Compares the disk in drive A with the disk in the currently logged drive. If the current drive is drive A, DISKCOMP prompts you to switch disk at various times during the comparison.

DISKCOMP A: B: /1/8

Compares the disk in drive A with the disk in drive B. Compares only the first side of each disk and only the first 8 sectors of each track.

Error Level Codes

- 0 = Disks are identical
- 1 = Disks are not identical
- 2 = Operator interrupted comparison with Ctrl-C
- 3 = Comparison interrupted by data errors or damaged disks
- 4 = Invalid drive letters, drive types or syntax error

Notes DISKCOMP compares floppy disks that are of the same size and data density. For example you cannot compare a 5.25", 1.2 M Byte disk with 5.25", 360 K Byte disk. You cannot compare hard disks or RAM disks using DISKCOMP.

DISK COPY

Copies the contents of one floppy disk to another on a track-by-track basis.

SYNTAX

DISKCOPY source: target: /switches

If the source drive and the target drive parameters are the same, DOS first reads the floppy disk in the source drive, then prompts you to remove the disks and insert the target disk into the same drive. You may have to switch disks more than once to complete the copying process.

If the target disk is unformatted, DISKCOPY will format the disk first. To do so, FORMAT.COM must be available to DOS either on the currently logged drive or the DOS search path.

SWITCH

- /1 Instructs DISKCOPY to copy only the first side of each disk, even with double sided disks.
- /V Instructs DISKCOPY to perform a validity check on the data copied to the target disk.

Example

DISCOPY A:

copies the disk in drive A: onto the disk in the currently logged drive. If the drive is drive A, DISCOPY prompts you to switch disks at different times during the copy process.

DISCOPY A: B: /1

Copies the disk in drive A into the disk in drive B. Copies only the first side of the source disk.

Error Level Codes

- 0 = copy completed successfully
- 1 = Read or write error caused differences between source and target disks.
- 2 = Operator interrupted copy with Ctrl-C
- 3 = Copy interrupted by data errors and damaged disks
- 4 = Invalid drive letters, drive types, insufficient RAM or syntax error

Notes DISKCOPY will only copy floppy disk that are of the same size. For example you cannot copy a 5.25", 1.2Mb floppy onto a 3.5, 1.44 Mb floppy. You cannot copy hard disks or RAM disk using DISKCOPY. You can copy the contents of one disk to another disk of a different size or density using the XCOPY or COPY commands. The target disk must be large enough to accommodate all the source files.

DOSKEY

Allows DOS to remember DOS commands, and permits the user to move the cursor along the command line, editing DOS commands before they are invoked.

SYNTAX

DOSKEY macro=commands[/options]

DOSKEY may be invoked without options. Once invoked, DOSKEY saves previously invoked DOS commands in a special buffer in RAM. The user may recall these previous commands by scrolling through the buffer. Pressing the up arrow key scrolls backward, and pressing the down arrow key scrolls forward.

Any command on the command line may be edited by moving the cursor to the appropriate point and retyping the correct characters. In DOSKEY, normal default state typed characters will overstrike existing characters on the command line. If the user presses the insert key, typed characters are inserted in place on the command line. Pressing *Insert* a second time returns to overstrike mode. Pressing *Enter* restores the default mode.

Each time the user enters a command, the command added to DOSKEY's

command buffer. This includes duplicate commands and edited commands.

DOSKEY does not affect the standard DOS function keys, but it adds function keys of its own:

- F7 Displays commands stored in memory.
- ALT-F7 Deletes all commands stored in memory.
- F8 Searches memory for a command. Type the first few characters of the desired command and press F8.
- F9 Prompts for a command line number and displays the associated command.
- ALT-F10 Deletes all macro definitions.

The *macro* parameter is user-defined name assigned to a set of keystrokes that are played back when the user enters DOSKEY followed by the macro name. To define a macro, invoke DOSKEY followed by the macro name, an equals sign and the keystrokes you want to record. Special characters have control meanings in a macro. They are:

- \$g Redirects output to a device or a file. Equal to > on the command line.
- \$g\$g Appends output to a device or a file. Equal to >> on the command line.
- \$l Redirects inputs to a device or a file. Equal to < on the command line.
- \$b Redirects output to a command. Equal to | on the command line.
- \$t Separates commands when you create a macro.
- \$ \$ Specifies the literal dollar-sign character (\$)
- \$1-\$9 Represents replaceable parameters in a macro. Similar to the %1 character in a batch program.
- \$* Wild-card replaceable parameter. Accepts everything added on the command line after you invoke DOSKEY and macro name.

SWITCHES

/INSERT

Changes commands line editing to insert mode as the default. Press the insert key to toggle between Insert and Overstrike mode.

/OVERSTRIKE	Changes command line editing to overstrike modes as the default. This is the default state, if no options are used. Press the <i>insert</i> key to toggle between overstrike and insert mode.
/REINSTALL	Installs an additional copy of DOSKEY in RAM. Clears the current command buffer. Resets new options if specified on the command line. Each time DOSKEY is reinstalled, it takes up an additional 4K of RAM plus whatever size you specify for the buffer.
/HISTORY	Displays all stored command lines.
/MACROS	Display all Doskey macros.

Examples

DOSKEY

Installs the DOSKEY buffer in RAM.

DOSKEY D=DIR \$1: /O:N /P

defines a macro named D, which will display a directory of a specified drive, in alphabetical order and permits entry of the drive letter without a colon.

DOSHELP

Help is displayed on the screen.

SYNTAX

DOSHELP command or command/?

DOSHELP displays a quick summary of DOS command options.

Example

DOSHELP MEMMAKER

displays a short summary of options for the MEMMAKER command

MEMMAKER/?

Displays the same information as the previous example. This syntax is marginally faster.

EDIT

Starts a full-screen text editor.

SYNTAX

EDIT drive: \path\file/D

EDIT is a menu-driven text editor. If you invoke EDIT without parameters the editor appears without a default open file. Alternatively, you may specify a file for EDIT to open when it loads.

EDIT includes an online help system. To access online help, select the Help keyword from the top line of the opening menu, or press F1 or Alt H.

SWITCHES

- | | |
|-------|--|
| /B | Forces black and white display. Use this switch if the Editor doesn't display properly on your monitor. |
| /G | Speed up screen display on CGA monitors. |
| /H | Alters line display for the current monitor. Use this option if the editor overlaps or does not fill the screen. |
| /NOHI | Corrects display on an 8-color monitors. |

Examples

EDIT MY-TEXT.FIL

starts the editor with MY-TEXT.FIL as the default. If the file doesn't already exist the editor creates it.

Notes EDIT requires that QBASIC.EXE be in the same directory as the file EDIT.COM, in the currently-logged directory, or on the DOS search path.

EXIT

Returns control from a secondary processor to the parent processor if one exists. Otherwise, EXIT has no effect.

SYNTAX

EXIT

FASTOPEN

It improves system performance by storing the hard disk locations of previously opened files and subdirectories in Random Access Memory (RAM). It also speeds up subsequent access of the same files and subdirectories.

SYNTAX

FASTOPEN drive: = n drive: = n drive: = n/switch

FAST OPEN requires a minimum one hard disk drive letter for the drive whose file and subdirectory name locations will be stored in RAM. You may specify from 1 to 4 drives on the FASTOPEN command line. FASTOPEN does not work with floppy disks.

SWITCH

/X Indicates that the file locations will be sorted in expanded memory. You must have installed an expanded memory manager for this option to work.

Examples

FASTOPEN C:

sets up RAM to store the locations of the last 48 opened files on the drive C.

FASTOPEN C: = 200 D: = 100/X

sets up RAM to store the locations of the last 200 opened files on drive C, and the last 100 of drive D. RAM will use expanded memory to store the file locations.

FC

Matches the contents of two files, or sets of files and reports the differences between them.

SYNTAX

FC/switches drive \path\file(s)drive\patfile(s)

FC requires the names of two files that you want to compare. You may include wildcard characters in the file name for comparison. If you do so, DOS compares the files that match each other within the naming convention represented by the wildcard characters. If either file set is not the current drive or subdirectory you must explicitly name the drive or subdirectory location of the files.

Files with extension BIN, COM, EXE, LIB, OBJ or SYS are compared as binary files unless you explicitly instruct DOS, by means of option switches, to do otherwise. All other files are compared as ASCII files unless you explicitly instruct DOS to do a binary comparison.

SWITCHES

- /A Condenses the report of differences when comparing ASCII files.
- /B Instructs DOS to perform a binary comparison: DOS compares the files byte-by-byte and reports all differences between bytes at the same offset location in the two files. The /B switch cannot be used in combination with any other option switch except the /nnnn switch.
- /C Instructs DOS to ignore case when comparing ASCII files. Characters in both files are treated as if they were uppercase.
- /L Forces an ASCII comparison on the files.

- /LB n Sets the maximum number of differing lines allowed in ASCII file.
- /N Includes line numbers in an ASCII comparison report.
- /T Does not expand tabs to spaces in an ASCII comparison report. If this switch is not used tabs are displayed as eight spaces.
- /W Condenses an ASCII comparison report by displaying all tabs and consecutive space as a single space. Tabs and spaces are only condensed in this switch, ignores space at the beginning and end of the line
- /nnnn Indicates the number of lines (or bytes in binary format comparisons) that must match after a difference is recorded. If less than this number is found the match is displayed in the report along with the differences. If this switch is not used the default is 2.

Example

```
FC TEST.TXT TEST.BAK
```

performs an ASCII comparison between TEST.TXT and TEST.BAK.

```
FD /B TEST.TXT TEST.BAK
```

Forces a binary comparison between TEST.TXT and TEST.BAK

```
FD /C /L /N /W *.BIN *.BAK
```

Forces an ASCII comparison between *.BIN and *.BAK disregards character case, displays line numbers in the report and condenses consecutive spaces.

FDISK

This command is used to partition a hard disk for DOS.

SYNTAX

FDISK /Switch

FDISK is a menu driven program that sets up partitions on your hard disk. Use FDISK to review current partition information, delete old partitions, and add new ones. A single partition may hold up to 2 gigabytes of data.

SWITCH

/STATUS Displays hard disk partition information without entering the program.

Example

FDISK/STATUS

displays your hard disk's partition information.

- Notes*
- (a) Before a hard disk can be formatted to accept data, it must be partitioned. In earlier versions of DOS, large hard disks required more than one partition because of early limits on hard disk size. Later versions of DOS corrected this. Most hard disks using DOS 6 need a single partition, unless they are installed on system that share another operating system besides DOS.
 - (b) FDISK is meant for system installers. It is normally not needed in the course of every day use. Deleting a partition permanently deletes all the data stored on that partition.
 - (c) FDISK only works on hard disks physically installed on your computer. FDISK does not work on a drive re-assigned using the SUBST command. FDISK is not intended for network or INTERLINK drives.

FIND

This command locates and displays all occurrences of a specified character string in a specified file.

SYNTAX

FIND /switches "string" drive\path\file

FIND requires that you include a character string on the command line. The character string must be enclosed in quotation marks. It is case-sensitive, meaning

that uppercase letters will not match lower-case letters. If the string contains quotation marks, they should be enclosed in another set of quotation marks. If you include a file specification, DOS reads the file and reports all occurrences of the character string in the file.

SWITCHES

- /C Counts the number of lines in the file that contain a match for the character string and reports the total only.
- /I Ignores letter case when searching for matching strings.
- /N Includes line numbers in the report of matching strings. If you include this option with the /C option, it is ignored.
- /V Reports only those lines that do not contain a match for the specified string. If you include this option with the /C option, DOS counts the number of lines that do not contain a match and reports that total.

Examples

```
FIND "FIND" SAMPLE.TXT /C
```

reports the total number of lines in SAMPLE.TXT that contain the string FIND.

```
CHKDSK /V | FIND "BAK" /N
```

uses the output of the CHKDSK /V command and displays all lines that contain BAK. The display is the relative line number of each line.

```
FIND SAMPLE.TXT /C/V
```

reports the total number of lines in SAMPLE.TXT.

FORMAT

Prepares a blank disk for receiving and storing data, or creates a new blank disk from a used one.

SYNTAX

FORMAT target: /switches

FORMAT requires that you specify a drive letter for the disk to format. When the formatting operation is complete, DOS displays a message showing the total number of bytes available on disk and how many bytes are in "bad sectors". DOS also indicated how data may be allocated on the newly formatted disks. DOS then asks if you would like to format another disk using the same parameters. If you enter Y, you are prompted to insert another disk. press the enter key and the formatting process starts. Otherwise you are returned to the DOS prompt.

If you supply the drive letter of a hard disk and your hard disk has a volume label, DOS prompts you to enter the volume label before it starts with the format.

SWITCHES

- /1 Formats a double-sided disk as a single-side disk.
- /4 Formats a single-density (160K) or double-density (360K) disk with the correct number of default tracks and sectors in a high-density (1.2Mb) drive.
- /8 Formats 8 sectors per track on 5.25" floppy disks instead of the default, which is 9 for single- or double-density disks or 15 for high-density disks. This option cannot be used with hard disks, nor can it be used with the /T or /V option.
- /B Formats a disk so as to leave room for the system files. Cannot be used with the /T or /S option. This switch is not needed in DOS 6, it is included only for compatibility with earlier versions.
- /F:size specifies the size in Kilobytes to be formatted. Not to be used with /1, /8, /T or /N options. The following parameters may be used for size.
 160K = 5.25" single-sided, 8 sectors/track
 180K = 5.25" single-sided, 9 sectors/track
 320K = 5.25" double-sided, 8 sectors/track
 360K = 5.25" double-sided, 9 sectors/track
 1.2M = 5.25" high-density, 15 sectors/track
 1.44M = 3.5" high-density, 15 sectors /track
 2.88 = 3.5" extra-high-density, 30 sectors/track
- /N:nn Indicates the number of sectors per track where nn is the number of sectors you specify. This option must be used together with the /T option. Do not use this parameter with the /8, / or /B options.

/Q	Specifies that formatting does not reinitialize tracks and sectors on previously formatted disk.
/S	Transfers DOS system files to the formatted disk, so that the formatted disk is bootable.
/T:nn	Indicates the number of tracks on the disk where nn is the number of tracks that you specify.
/U	Specifies unconditional reformatting. All data on a previously formatted disk is destroyed and you will not be able to unformat this disk later.
/V	Prompts you to add a volume label to the disk after formatting.

Examples

FORMAT A: /S/V

formats a disk in drive A using current drive default , then copies the system files to the disk and prompts the user to enter a volume label for that disk.

FORMAT A:/4

FORMAT A:/F:360K

formats a 5.25" double-density (360K) disk in a high-density (1.2 Mb) drive.

FORMAT A:/T:80 /N:9

format a 3.5" low-density (720K) disk in a high-Density (1.44Mb) drive.

Error Level Codes

The codes indicate difficulties encountered while formatting the disk.

0 = Format successful

3 = Format interrupted by Ctrl-C-break

4 = Format interrupted by disk data or other technical error.

5 = User responded N to hard disk safety prompt, "proceed with format?"

Before you can use FORMAT on hard disks, *low-level* format must be completed using DISK MANAGER. The hard disk must be partitioned using FDISK.

GRAPHICS

This command allows graphics characters to be sent to an IBM-compatible

graphics printer using Shift-Prtscl.

SYNTAX

GRAPHICS printer drive:\path\file /switches

Used without parameters, the GRAPHICS command will allow the Shift-Prtscl key combination to send screen graphics characters to an IBM graphics printer, that is fully compatible. In addition to use this command, you must have a monitor that can display the IBM graphics character set.

You may specify the following alternate types of graphics printers on the command line.

COLORI = IBM Color printer with black ribbon

COLOR2 = IBM Color printer with red, green, blue, black, ribbon.

COLOR8 = IBM Color printer with cyan, magenta, yellow, black ribbon

HPDEFAULT = any Hewlett-Packard PCL printer

DESKJET = Hewlett-Packard Deskjet printer

GRAPHICS = IBM personal Graphics printer, proprinter, or Quietwriter

GRAPHICSWIDE = IBM personal Graphics printer with 11 inch carriage

LASERJET = Hewlett-Packard laserjet printer

LASERJETII = Hewlett-Packard Laserjet II printer

PAINTJET = Hewlett-Packard paintjet printer

QUIETJET = Hewlett-Packard Quietjet printer

QUIETJETPLUS = Hewlett-Packard Quietjet plus printer

RUGGEDWRITER = Hewlett-Packard Ruggedwriter Printer

THERMAL = IBM PC convertible Thermal Printer

THINKJET = Hewlett-Packard Thinkjet Printer

Use the *file* parameter (with *drive:\path* if required) to specify the name and location of a *printer profile file*, containing information about all supported printers. If you do not supply this parameter DOS looks for a file named GRAPHICS.PRO in the current directory and in the same directory as GRAPHICS.COM.

SWITCHES

/R	Reverses foreground and background. Normally, the screen shows light characters in a dark background. When printing, the light characters prints as dark characters and the background is not printed.
/B	Prints background color. This option is only available with the COLOR4 and COLOR8 printers. If you do not specify this switch the background is not printed.
/LCD	Prints characters from the IBM PC Covertible Liquid Crystal display.
/PRINTBOX:AAA	Selects the size of the print box, where AAA is the print-box ID.tag, the first parameter following the printbox statment in your printer profile.

Examples

GRAPHICS

Allows Shift-Prtsc to send IBM graphics characters to an IBM Graphics Printer.

GRAPHICS COLOR4 /B

Prints on the red, green, blue, black, IBM color printer including background color.

GRAPHICS THERMAL /LCD

Prints on the IBM Convertible thermal printer form the IBM convertible liquiid crystal display.

HELP

This command displays summary of command syntax.

SYNTAX

HELP command

Invoke the HELP command without parameters to begin DOS's interactive help system. DOS will list its standard line, batch, and CONFIG .SYS commands. To receive help with a particular command move the cursor to the desired command and press enter, or pick the command using the mouse if you have one installed. Alternatively, you can get help for a particular command by invoking HELP followed by the command name.

Most commands include a syntax summary notes and examples. You can use the mouse or the keyboard to move between various menu options. If you are using the keyboard you can select menu items by holding down the Alt Key and pressing the keyboard key that corresponds to the highlighted character in the screen menu item.

HELP includes its own on line help system. To access online help, select the Help keyword from the top line of the opening menu, or press F1 or Alt-H.

Examples

HELP

starts DOS's interactive help system.

HELP DOSKEY

displays a short description of DOSKEY command syntax.

Notes For a more condensed command summary you may enter the command name, followed by /? or DOSHELP, followed by the command name.

INTERLNK

Redirects commands to interlnk server drives or printer ports.

SYNTAX

INTERLNK client = server

This command works if you have installed the INTERLNK.EXE device driver in CONFIG.SYS file.

The *client* parameter is a drive letter that indicates the client drive to be redirected. The *server* parameter specifies the drive letter of the interlnk server that will be redirected. The server drive must be listed in the server column of the interlnk server screen. Colons are not necessary when specifying drive letters with this command.

Examples

INTERLNK D = C

redirects client drive D to server drive C. This command might be used to link a laptop computer to a desktop computer to transfer files.

INTERSRV

This command starts the Interlnk server for transfer of file between Interlnk devices and drives.

SYNTAX

INTERSRV drive:/switches

You must first install the INTERLNK.EXE device driver in CONFIG.SYS.

The *drive* : Parameter specifies a drive letter for the redirected drive. All drives are redirected by default.

SWITCHES

/B	Forces black and white displays on colour monitors and laptops that have trouble handing the default displays
/BAUD:rate	Sets the maximum baud rate for data transfers. Valid rates are 9600, 19200, 38400, 57600, and 115200. Default is 115200.

<i>/COMn:</i> <i>address</i>	Specifies which serial port to use ,where <i>n</i> is the number of the port. By default all ports (parallel and serial) are scanned when you invoke INTERSRV.
<i>/LPTn:</i> <i>address</i>	Specifies which parallel port to use where <i>n</i> is the number of the port. If you omit both parameters, the Interlnk server uses the first client parallel port it finds.
<i>/V</i>	Overrides timer conflicts for use with computers whose internal timers cannot synchronize for jam serial communications.
<i>/RCOPY</i>	Downloads and installs interlnk files from one computer to another computer with a 7-wire null-modem serial cable. The MODE command must be available on the computer on which you are installing Interlnk
<i>/X=drive</i>	specifies drive not to be redirected, where <i>drive</i> is the drive letter.

Examples

INTERSRV A: B: C:

Starts the interlnk server and redirects server drive A to client drive D, server drive B to client drive E, and server drive C to client drive F.

INTERSRV /X=A /COM2

Specifies all server drives be redirected except drive A, and forces connection via COM2.

Notes Interlnk does not redirect network drives, CD-ROM drives or devices that already utilize a redirection interface. Interlnk redirects drive in the order you specify. The first server drives is redirected to the first client drive; the second server drive to the second client drive and so on.

KEYB

Loads a nonstandard keyboard configuration in to memory. The located configuration is taken from a library file, usually KEYBOARD.SYS.

SYNTAX

KEYB keyboard, codepage drive:\path \libraryfile /switches

The *keyboard* parameter is a two-letter code indicating the nonstandard keyboard you want to load. This code will represent a country as per the table given below.

The *codepage* parameter is optional. It is a three-digit number representing a table that defines a foreign language character set to be used by the keyboard. If this parameter is not supplied, DOS uses the current code page.

The *libraryfile* parameter is used only if the library file is not the KEYBOARD.SYS or if the location of the library file is not on the operating system's search path.

SWITCHES

/E Specifies that an enhanced keyboard is installed on an Intel 8086-based (XT-type) computer;

Examples

KEYB

Displays the currently installed nonstandard keyboard configuration, if any.

KEYB-UK

installs the United Kingdom keyboard.

Error Level Codes

- 0 = Installation was successful
- 1 = Invalid command line syntax
- 2 = Keyboards library file not found or invalid
- 3 = Could not load keyboard configuration.
- 4 = Error with enclose device
- 5 = Requested code page was not prepared

6 = Code page table not found

7 = Incorrect DOS version

Notes Before you invoke KEYB, the code page you specify for *codepage* must be prepared for your system. Prepare the codepage by first including the COUNTRY command in CONFIG.SYS, then invoking the NLSFUNC command.

Table 1 Keyboard Codes

Country	Code	Keyboard code page (Alternate)	Keyboards IDs
United States (default)	US	850 (437)	
Belgium	BE	850 (437)	
Brazil	BR	850 (437)	
Canadian (French)	CF	850 (863)	
Czechoslovakia (Czech)	CZ	852 (850)	
Czechoslovakia (Slovak)	SL	852 (850)	
Denmark	DK	850 (865)	
Finland	SU	850 (437)	
France	FR	850 (437)	120,189
Germany	GR	850 (437)	
Hungary	HU	852 (850)	
Italy	IT	850 (437)	141,142
Latin America	LA	850 (437)	
Netherlands	NL	850 (437)	
Norway	NO	850 (865)	
Poland	PL	852 (850)	
Portugal	PO	850 (860)	
Spain	SP	850 (437)	
Sweden	SV	850 (437)	
Swiss (French)	SF	850 (437)	
Swiss (German)	SG	850 (437)	
United Kingdom	UK	850 (437)	166,168
Yugoslavia	YU	852 (850)	

LABEL

This command adds or modifies a disk volume label.

SYNTAX

LABEL target:label

The LABEL command requires a drive letter on the command line. If you include the optional *label* parameter, DOS writes the specified volume label on the disk indicated by the drive letter. If you do not include the *label* parameter on the command line, DOS prompts you to enter volume label. If you press Enter without entering a volume label, DOS assumes that you want to delete the current label and prompt you to confirm the deletion. If you want to delete the current label enter, Y otherwise enter N.

Examples

LABEL C:

Will cause DOS to prompt you to enter a volume label for a disk in drive C (often a hard disk).

LABEL C:MY DATA

will write the volume label "MY DATA" on the disk in drive C.

LH OR LOADHIGH

Loads terminate-and-stay-resident (TSR) software into reserve memory.

SYNTAX

LH /switches drive e:\path\program

LOADHIGH /Switches drive \path\program

The LH and LOADHIGH commands attempt to load the terminate-and-stay

-resident (TSR) program specified in the *program* parameter in to *reserved memory*, the area of the RAM between 640K and 1024K, provided that DOS can find available space. You should first load the HIMEM.SYS device driver plus an expanded memory manager that supports the Microsoft Extended Memory Specification for upper memory blocks (UMBs); for example, EMM386.EXE, which is supplied with MS-DOS. Use CONFIG.SYS to load these driver files. In addition you must also include the UMB parameter in the DOS=Command line in CONFIG.SYS.

SWITCHES

/L:region,minsize1; region2, minsize2...

If this switch is not used, DOS loads the program into the largest UMB it finds. Regions are numbered using integers beginning with 1.

DOS loads the program into the largest UMB in the specified region provided it can find a UMB that is larger than the program's load size. You can specify more than one memory region in cases where a program uses more than one. Separate the region numbers on the command line with a semicolon. Some programs expand in memory while running. If you are loading such a program you can also indicate a minimum size for a UMB in the specified region (in bytes). DOS will load the program if it can find a UMB that is larger than the program's load size and the indicated minimum size. Separate the minimum size value from the region number using a comma.

/S

This switch shrinks the UMB to its minimum size while loading. This switch helps maximize use of upper memory. You can use this switch only if you are also using the /L switch to specify a minimum size for UMBs.

Examples

LH MOUSE

Loads the mouse driver software into reserved memory.

LH /L:1, 11504 SETVER.EXE

It loads SETVER.EXE in memory region 1, provided there is a UMB of at least 11,504 bytes in that region.

Notes The MEMMAKER command can help you analyze your system's use of memory and determine which drive and programs can fit into UMBs. It can rewrite your AUTOEXEC.BAT file, adding LOADHIGH commands with /L and /S switches as required.

LOADFIX

This command is used to run application software that may not load properly if DOS 6 occupies high memory.

SYNTAX

LOADFIX drive:\path\program

LOADFIX causes external application to be loaded above the first 64K of conventional memory. If you try to run a program that runs under an earlier version of DOS and receive a "Packed file corrupt" message under DOS 6, then try to invoke the program with LOADFIX.

Example

LOADFIX FASTBACK

loads FASTBACK.EXE in conventional memory.

MEM

This command displays information on allocation of random access memory.

SYNTAX

MEM /switches

When invoked without option switches, MEM displays a summary of the amount

and type of installed memory.

SWITCHES

/Classify	Use this switch to list currently loaded programs, including the amount of memory each is using. /C also specifies this switch.
/Debug	Lists programs and system device drivers including their RAM addresses. You cannot use the /program switch with this switch.
/Free	Lists the free areas of RAM including address and size. If an expanded memory manager is installed and includes Upper Memory Blocks, this parameter also shows the largest UMB in each region of upper memory. You cannot use this switch with any other switch except /page. /F also specifies this switch.
Module Program	Displays RAM in use by a particular program. You must specify a name of a loaded program after this switch. You cannot use this switch with any other switch except /page.
/page	Pauses after each screen of output. /P also specifies this switch.

Example

MEM /CLASSIFY

lists amount and type of installed RAM, and how it is allocated among loaded programs.

Note MEM finds extended memory above 1 Mb if installed. MEM will only find expanded memory that conforms to the LIM 4.0 expanded memory specification.

MEMMAKER

It configures your system's device drivers to optimize random-access memory.

SYNTAX

MEMMAKER /switches

MEMMAKER analyzes current system configuration and rewrites CONFIG.SYS and AUTOEXEC.BAT (plus windows' SYSTEM.INI if necessary) to make optimal use of your system's random-access memory (RAM). If you invoke MEMMAKER without command -line switches, the program presents you with a full screen menu driven RAM optimization system.

As MEMMAKER processes, it presents you with a series of choices. First you can choose between Custom or Express setup. Express setup uses default responses to most configurable options and is faster. Custom setup is for experienced users, allowing you to fine tune memory requirements to your liking. MEMMAKER includes an extensive online help system. To access online help, press F1.

MEMMAKER will restart your computer twice during processing. If it appears to stop for several minutes, restart your computer by turning it off and back on again.

SWITCHES

/BATCH	Runs unattended (batch) mode. Memmaker assumes default responses for all prompts.
/SWAP:drive	Specifies your current startup drive, where drive is the letter. Use this switch if your startup disk drive changed after your computer started. Do not use this switch with Microsoft DoubleSpace or stacker 2.0 compressed drives.
/UNDO	Undo the most recent changes made by MEMMAKER. Restart MEMMAKER using this switch if your system doesn't work properly after MEMMAKER completes or if you are not satisfied with your new memory configuration.
/W:size1,size2	Specifies the amount of upper-memory space for windows translation buffers; Windows requires two regions in upper memory for these buffers,

where *size1* is the first region, *size2* is the second in kilo-bytes (K). Default is two 12K regions of upper memory (/W:12,12). If you don't use Windows you can specify /W:0,0 and save some upper memory for other programs.

Examples

MEMMAKER/BATCH

This command starts MEMMAKER in batch mode, and automatically rewrites system configuration files using all default responses for your system.

MEMMAKER /UNDO

starts MEMMAKER and reverses the changes made using the previous example.

Notes MEMMAKER stores the original version of AUTOEXEC.BAT as AUTOEXEC.UMB, CONFIG.SYS as CONFIG.UMB and Windows SYSTEM.INI as SYSTEM.UMB. you can undo MEMMAKER's changes by deleting the revised versions and renaming the files with UMB extensions. However if you undo the revisions on any one file; undo does the revisions on all the others files also.

MODE

This command performs various functions relating to the transfer of data between the processor, screen, printer and keyboard. The MODE command:

- (a) Sets the parallel printer mode.
- (b) Sets serial communication protocols.
- (c) Redirects parallel printer output.
- (d) Sets the video mode.
- (e) Shifts screen left or right.
- (f) Sets screen length and width.
- (g) Prepares and selects code pages.
- (h) Sets key repetition rates.
- (i) Displays the status of attached devices.

SYNTAX

To set the parallel printer mode you can give the following command.

MODE lptn: cols=c lines=/ retry=r

alternate syntax

MODE lptn: c, l, r

You must specify a parallel printer device name as LPT followed by a number from 1 to 3, depending on the number of parallel ports on your system. C indicates the number of columns (always equal to the number of text characters) per line. L indicates the number of printed lines per inch. R indicates how DOS should react if the printer is not accepting data, where r is replaced with one of four possible parameters:

- B Return "busy" code if printer is not accepting data.
- E Return a DOS error message indicating that the printer is not accepting data.
- N Abort data transmission to the printer port with the "Abort, Retry /Ignore/Fail?" error message. This indicates that DOS should not retry sending data.
- P Retry sending data until printer accepts it. To break out of this loop, press Ctrl-Break.
- R Resets the port to "Ready" status; sends the data.

To set serial communication protocols:

MODE comn: baud=bb parity=p data=d stop=s retry=r

Alternate syntax

MODE com n: bb,p,d,s,r

Before you initialize serial communication settings, you should refer to the documentation for the connected printer or modem device to determine the correct setting for parameter used in the command. The first parameter indicates the communication port that you want to use, where *n* after COM is the number of the port. Baud=bb indicates the baud rate. Only the first two digits of the baud rate are significant for example, baud = 9600 can also be expressed as baud = 96. Parity=p indicates the parity type where p can be one of the following values: Default is Even parity.

N	No parity
E	Even parity
O	Odd parity
M	Stick odd parity
S	Stick even parity

Data=d Indicates the number of databits, where d is a value from 5 through 8 (the default is 7). Stop=s indicates the number of stopbits, where s is either 1, 1.5 or 2. (the default is 2 if the baud rate is 110 otherwise, it is 1.)

Retry=r is used if the peripheral device is a printer. It indicated how DOS should react if the printer is not accepting data, where r is replaced with one of four possible parameters, the same as those used with the retry=r argument when setting parallel communication protocols.

If you are using the alternate syntax, MODE requires that the parameters be in their specific position as shown in the alternate syntax line. If you do not specify a value for any parameter you must still include the comma before the next parameter. For example to redirect parallel printer output to serial port, give the command

MODE lptn: = comn:

You must specify a valid parallel and serial port number for your system, where n is the port number. Before directing parallel output to a serial port, use the MODE command to initialize the serial communications parameters as explained earlier.

To set the video mode.

MODE videomode/length, shift.T

The *videomode* parameter may be one of several possible values. Following are the *videomode* codes supported by MODE.

40 or 80	Indicates the number of characters per line.
BW 40 or BW 80	Specifies black -and-white on a CGA display plus the number of characters per line.
CO 40 or CO 80	Specifies a color monitor and specifies the number of characters per line.
MONO	Specifies monochrome display (80 characters per line).

The optional *length* parameter indicates the number of lines that your monitor can display. It may be supplied only if the ANSI.SYS device driver was loaded in the CONFIG.SYS file. The screen length may be any number of lines that your

monitor is capable of displaying refer to your monitor and graphics card documentation for details.

The optional *shift* parameter shifts the screen displays one or two characters to the right or left. Replace *Shift* with R to shift right or L to shift left. This parameter cannot be used on the same command line with the *length* parameter. You should use one or the other not both. If you use the *shift* parameter you may also supply the optional *T* parameter. If this parameter is supplied, MODE will display a test pattern of the screen allowing you to visualize the results of the shifting.

To set screen length and width give the command:

```
MODE CON LINES=nn COLS=nn
```

The command will work only if the ANSI.SYS device driver was loaded in the CONFIG.SYS file. You must use CON as the first character to indicate that you are setting lines and columns for the console device. The nn in lines=nn indicates the number of screen lines to display. (Be certain that your monitor is capable of displaying the number of lines you specify). The nn in COLS=nn indicates the number of screen columns, number of character per line, to display.

To prepare code pages (foreign character sets) for use by a peripheral device give the command:

```
MODE device CODEPAGE PREPARE=(code page list) drive:\path\file)
```

The *device* parameter indicates one of the standard DOS output device (CON, PRN or ¹LPT1-3). Serial communications ports are not a valid device in this context.

A *code page* is a three-digit number referencing a particular foreign character set used by the printer, screen or keyboard. Following are the code pages and countries supported by MODE:

437	United States
850	Multilingual (Latin 1)
852	Slavic (Latin 11)
860	Portuguese
863	Canadian-French
865	Nordic

After the code page list you should include the name of the codepage information file. This file has a CPI extension and contains the device definitions attached to the foreign fonts you have specified. The CPI extension is not required but you

¹ LPT1-3 means parallel port 1 to 3 i.e. LPT1, or LPT2 or LPT3.

must include a drive letter and subdirectory path if the code page information file is not located on the currently logged drive and path.

To make a particular code page active:

```
MODE device CODEPAGE SELECT=nnn
```

The *device* parameter indicates one of the standard DOS output devices (CON, PRN, LPT1-3) for which a code page has been previously prepared where *nnn* indicates the number of the prepared code page to make active. You may substitute CP for CODEPAGE and SEL for SELECT in the above syntax. You must use the DEVICE command in CONFIG.SYS to install the DISPLAY.SYS driver file to use mode for code-page switching.

To reinstate a code page that has been lost use the following command.

```
MODE device CODEPAGE REFRESH
```

To see a display of the current code page setup:

```
MODE device CODEPAGE /STATUS
```

The *device* parameter indicates one of the standard DOS output devices (CON, PRN, LPT1-3) for which a codepage has been prepared.

To set key repetition rates:

```
MODE CON RATE=nn DELAY=n
```

where *nn* indicates the approximate number of times per second (1 to 32) a key will repeat when it is held down. The number supplied in place of *nn* does not correspond to the actual number of times per second the key repeats; lower numbers repeat slightly faster than their value. higher numbers repeat slightly slower. DELAY=*n* indicates the amount of time required to hold a key down before it begins repeating, where *n* is a delay value. If you set the rate you must also include a setting for the delay. The range of valid delay values is from 1 to 4, where 1 equal 1/4 second, 2 equals 1/2 second, 3 equals 3/4 second and 4 equals 1 second.

To display the status of a particular device on all versions:

```
MODE device /STATUS
```

The *device* parameter indicates the device whose status you want to check. Valid device names are CON, PRN, LPT1-3, and COM1-4. The /STATUS parameter is used only when the output of the device you are checking was previously redirected to another device.

Examples

```
MODE COM1 BAUD=9600 PARITY = NON DATA = 8
STOP = 1 RETRY = B
```

sets the communication protocol on the first serial port to 9600 baud, no parity, eight databits, and one stop bit, for a printing device.

```
MODE LPT1 = COM1
```

redirects standard parallel printer output to the first serial port.

```
MODE LPT1 /STATUS
```

checks the status of a redirected parallel printer. Without the /STATUS switch, MODE would remove redirection from the parallel port.

```
MODE CON CODEPAGE PREP=((865, 437) C:\DOS\EGA)
```

prepares the code pages for Denmark and Germany for use by an EGA- type display device.

```
MODE CON RATE=25 DELAY=1
```

sets keyboards repetition rates to 16 per second after holding the key down for 1/4 second.

```
MODE CON
```

Displays the status of all devices on the system.

MORE

This command makes DOS to display output one screen at a time instead of continuous scrolling.

SYNTAX

```
MORE < drive :\path\file(s)
```

Alternate syntax:

```
command [parameter(s)] | MORE
```

There are two ways to use the MORE command:

- (a) If you would like to display the contents of a data file on the screen, enter MORE followed by the redirection symbol for input (<) then by the name of the file. Wildcard characters are not allowed.
- (b) If you would like to display the output of another command, enter the command and any required parameters followed by the direction symbol for piping (|), then by MORE.

When you use MORE to display output, the display will stop each time the screen fills with information. To continue the display, press any key.

Example

```
MORE < REPORT.TXT
```

Displays the contents of REPORT.TXT on the screen, pausing each time the screen is full.

```
TYPE REPORT.TXT | MORE
```

has the same result as the previous example. In this case, the output of the TYPE commands is redirected to MORE.

MOVE

This command moves files to different locations. It can also rename subdirectories. This command can overwrite or delete data. So be careful!

SYNTAX

MOVE source:\path\file(s) target:\path\file(s)

MOVE requires that you specify the name of a source file or files. You can include a drive letter or directory path if the source file is not on the currently-logged directory. Wildcards are allowed and will move groups of files that match the wildcard specification.

MOVE has the same effect as copying a file to a new location and then deleting the file in the original location, in a single command. You can rename a file as

you move it by specifying a new name for the file. You can specify only one file as the source if you are renaming it at the same time. If you do not specify a *target* location, DOS attempts to move the source file to the currently logged directory.

Example

```
MOVE C:\TEMP C:\NEWLOCA
```

If C:\TEMP is a file, it is moved from the root directory to the C:\NEWLOCA directory, if C:\TEMP is a directory it is renamed C:\NEWLOCA.

MSAV

This command scans memory and hard disks for the presence of computer viruses.

SYNTAX

MSAV drive:\path/switches

If you invoke the MSAV command without parameters you are presented with a full screen menu-drive system. You may select the drive or directory whose files you want to analyze and specify various options. You can use a mouse or the keyboard to move between various menu options. If you are using the keyboard, you can move between menu items using the arrowkeys and select items by pressing the space bar. Alternatively, you can select items by holding down the Alt key and pressing the keyboard key that corresponds to the highlighted character in the screen menu item.

Alternatively, you can select the drive, directory and options by entering the drive letter on the command line when you invoke MSAV along with various control switch.

SWITCHES

/S

Scans files on the specified drives and directories but does not remove viruses. This switch is default.

/C	Scans files on the specified drives and directories and removes viruses.
/R	Creates a report on disk (MSAV.RPT) that lists the number of files checked, the number of viruses found, and the number or viruses removed.
/A	Excludes drives A and B.
/L	Excludes network drives.
/	Turns off display while scanning and displays MSAV.RPT file when complete.
/P	Runs MSAV in graphics mode.
/F	Turns off the display of filenames. Use it with the /N or /P switch.
/NGM	Forces default mouse character.
/LE	Reverses left/right mouse buttons.
/IM	Disables mouse.
/PS2	Resets mouse cursor.

Example

MSAV /A/P

Runs MSAV, excluding floppy drives A and B and forcing graphics mode.

|| MSBACKUP

This command backs up and restores files. This command can overwrite or erase data. So be careful!

SYNTAX

MSBACKUP specfile/switches

SWITCHES

- /TF (Type = full) Backs up all files named in the specification file.
- /TI (Type = Incremental) Backs up all files named in the specification file that have changed since the last backup.
- /TD (Type = Differential) Backs up all files named in the specification file that have changed since the last full backup.
- /BW Starts MSBACKUP in black-and-white for monitors that have trouble displaying the screen colors.

Examples

MSBACKUP MY-FILES

Starts the backup program using (or creating) a specification file called MY-FILES.SET.

MSD

This command produces a technical diagnostic and information report for IBM PC system.

SYNTAX

MSD /switches

MSD may be invoked without switches, in which case it will display an interactive menu-driven display of technical information about your computer. To see information on any particular device, press the highlighted letter in the device's menu box.

SWITCHES

/B

Forces black and white mode on color displays

	that do not correctly display MSD output.
/I	Bypass initial hardware detection. Use this switch if MSD does not run properly.
/Fdrive:\path\filename	Runs full reporting. Prompts for name and company information then writes a report on disk using the <i>drive:\path</i> and <i>filename</i> parameters you specify.
/Pdrive:\path\filename	Runs partial reporting. (Bypass prompts for name and company information). Writes a report on disk using the <i>drive:\path</i> and <i>filename</i> parameters you specify.
/Sdrive:\path\filename	Writes a short summary report on disk using the <i>drive \path</i> and <i>filename</i> parameters you specify.

If you do not specify a *drive \ path* or *filename*, MSD displays the report on the screen.

Examples

MSD\PC:\DOS\MSDRPT.TXT

runs MSD and write a report to the file C: DOS\MSDRPT.TXT.

NLSFUNC

Loads national language support functions, allowing you to switch international character set tables in RAM.

SYNTAX

NLSFUNC drive:\path\countryfile

If you want to use the CHCP command to switch code pages for multiple foreign language character sets, invoke this command first. You need only invoke the command once per session.

The NLSFUNC command may be invoked without parameters. If you do so, DOS uses the country specific information found in the COUNTRY.SYS file to support code page switching between international character sets using the CHCP command.

If you are using a file other than COUNTRY.SYS or if COUNTRY.SYS cannot be found along the DOS search path, specify the correct file name and search path on the command line when you invoke NLSFUNC.

Example

NLSFUNC C:\SYS\COUNTRY.SYS

Loads national language support functions from COUNTRY.SYS located in the C:\SYS subdirectory.

Note The default value for the country information file is defined by the COUNTRY command in CONFIG.SYS. If this command is not present in CONFIG.SYS, NLSFUNC looks for a file named COUNTRY.SYS in the root directory of the start up drive. (usually C).

POWER

It is used to reduce power usage when the system is idle. Intended for battery-operated laptop and portable IBM PC XT/AT systems.

SYNTAX

POWER ADV:status\STD\OFF/switch

To set up power conservation invoke power with the ADV:status parameter, where status is one of the following codes

- | | |
|-----|--|
| MAX | Maximum power conservation. |
| REG | Balance power conservation with device performance (default). |
| MIN | Minimum power conservation. Use when devices perform poorly under one of the other settings. |

SWITCH

/LOW Forces POWER to be loaded in conventional memory. By default power loads into the upper memory area, if available.

Example

POWER ADV: MAX
enables maximum power conservation.

PRINT

This command sets aside a portion of RAM for printing a series of files in the background while you continue to work with DOS. This command is important as it gives the capability also used for spooling the printing activities.

SYNTAX

PRINT switches drive:\path\file(s) /switches

If invoked without parameters, PRINT displays the states of the list of files to be printed.

To configure DOS background printing, enter the PRINT command followed by whatever options you desire and a filename. Wildcard characters are permitted in file names. Each time to invoke PRINT with file names, the files are added to the print queue, up to the maximum specified by the /Q switch. DOS sends the contents of the file to a buffer in RAM which in turn sends the data to the printing device while allowing you to continue to invoke other operating system commands or application software. Thus you can use your system and also continue printing job at the same time.

SWITCHES

When background printing is active, DOS is alternating very quickly between the

foreground processing and the background printing. Optional parameters allow you to control the output device receiving the output.

The /D, /B, /U, /M /S, and /Q switches configure the background printing environment. Therefore, they may be used only once per session , the first time you invoke PRINT. The /C and /P switches must be preceded by a file name. All switches may be followed by file names, except the /Q switch, which may not be used on the same command line with a file name.

The least confusing way to use the PRINT command is to invoke it once with the configuration switches, then a second time to add file names to the queue.

/B:buffer size	Specifies the size, in bytes, of the printer buffer. The maximum size is 16,384 bytes. A larger buffer speeds printing, but requires additional RAM.
/D:Device	Specifies the output device name. If you do not use this switch on the command line (it must be the first switch following PRINT), DOS will prompt you to enter the device name. Default is PRN, the first parallel port on your system.
/M:ticks	Specifies the maximum number of internal clock ticks DOS will take to send a character to the printer. Default is 2. The maximum value is 255.
/Q:queue size	Specifies the maximum number of files allowed in the print queue. The minimum number of files is 4, the maximum is 32 Default is 10.
/S:slice	Specifies the maximum number of internal clock ticks DOS will allow for foreground processing. Default is 8. The Maximum value is 255.
/T	Removes all files from the print queue
U:ticks	Specifies the number of ticks on the computers internal clock that DOS will wait before giving up and returning to foreground processing if the printer is not ready to receive data. Default is 1.
file name /C	Removes the indicated file name from the print queue. If additional file names follow this switch, they are removed as well.
file name /P	Adds the indicated file name to the print queue. If

additional file names follow this switch, they are added to the queue also.

Examples

```
PRINT /D:COM1 /Q:32 /B:4096 /S:20 /M:4 /U:2
```

directs the printing output to the first serial port. It allows 32 file names in the print queue, sets a buffer size of 4K, sets the foreground processing time to 20 clock ticks, sets the background printing time to 4 clock ticks, and waits for 2 ticks, if the printer is busy.

```
PRINT C:\REPORT\*.TXT
```

Prints all files in the C:\REPORT subdirectory with the TXT extension.

```
PRINT C:\REPORT\REPORT3.TXT /C  
C:\REPORT\REPORT3.BAK /P
```

removes C:\REPORT\REPORT3.TXT /C from the print queue and adds C:\REPORT\REPORT3.BAK to the print queue.

Note The PRINT utility only works from DOS. It has no effect on printing command that are invoked from other application. It can print text files while other applications are running depending on the specific application and the switch settings for PRINT, it may cause a noticeable reduction in processing speed. Disk accessing interrupts background printing. Programs that access the disk frequently will degrade the performance of PRINT.

REPLACE

This command updates files on a target directory by replacing them with files of the same name on a source directory or add as files to the target directory from the source directory.

SYNTAX

REPLACE Source:\path\file(s) target:\path/switches

REPLACE requires two parameters: source file names (wildcard characters are allowed) and a target drive; where the replacement files are to be copied. Source file names may include a subdirectory path as well. The target parameter does not include file names or wildcard characters.

REPLACE differs from the copy command in that it is more flexible, allowing various optional approaches to the process of copying files from one location to another.

SWITCHES

- /A Adds files. Copies files from the source only if they do not already exist on the target. This option may not be used with /S or /V options.
- /P Displays a prompt asking you to confirm each copy before copying the file to the target.
- /R Disables overwrite protection for read-only files on the target.
- /S Searches all subdirectories of the target directory for files that match the name of each source file. Source subdirectories are not searched. Do not use this option with the /A option.
- /U Updates only; replaces files in the target location only if they are older than those in the source location.
- /W Pauses processing before starting the replacement process. Allows you to switch source or target disks if necessary.

Example

```
REPLACE A:*. * C: /S /U /P
```

replaces files on drive C (the target) that have the same name as any files on drive A (the source)-if those files on drive C are older than the files on drive A- and prompts for confirmation before each replacement is made.

Errorlevel Codes

- 0 = Replacement successful
- 1 = Incompatible DOS version
- 2 = Source or target files not found
- 3 = Source or target locations not found

- 5 = Disk access denied; disk write-protect enabled
- 8 = Insufficient RAM for REPLACE
- 11 = Syntax error on command line
- 15 = Invalid drive specification

Note Do not use REPLACE to copy files from a source drive made using the BACKUP command from older versions of DOS. Use RESTORE instead. REPLACE does not work with the hidden or system files.

RESTORE

This command restores files from disks made using the BACKUP command from, earlier versions of DOS.

SYNTAX

RESTORE source drive: target drive: \path \file (s) [/switches]

RESTORE requires two parameters: a source drive (a floppy-diskdrive), where the backup files are located, and a target drive (usually a hard disk), where the restored files are to be located.

RESTORE is used only to restore files that were backed up using the BACKUP command. DOS 6 does not include a BACKUP command. This utility is present only for compatibility with earlier versions of DOS.

BACKUP remembers the original subdirectory locations of the files it backed up, and RESTORE restores the backup files to the same subdirectory.

SWITCHES

- /A:mm-dd-yy* Forces restoration of only those files that were modified on or after the specified date, where *mm* is the month, *dd* is the day and *yy* is the year. Files modified before the specified date are not restored.
- /B:mm-dd-yy* Forces restoration of only those files that were modified on or before the specified date. File modified after the specified date are not restored.

/D	Displays file names(s) on the backup disk but does not restore them. Notice that the target drive is still required in the syntax, although it is not used.
/E:hh-mm-ss	Forces restoration of those files modified at or earlier than the specified time, where <i>hh</i> is the hour (in 24 hour format), <i>mm</i> is the minutes after the hour, and <i>ss</i> is the seconds. This switch is effective when used with the /B switch. Without a date parameter target files from different dates can be overwritten if their time stamp matches the specified pattern.
/L:hh: mm: ss	Forces restoration of only those files that were modified at or after the specified time. Without a date parameter, target files from different dates can be overwritten if their time stamp matches the specified pattern.
/M	Restores only those files that were modified since the last backup was made.
/N	Restores only those files that were deleted since the last backup.
/P	Prompts to confirm the restoration of files that were changed since the last backup or marked as read-only files. Without this parameter all files on the target drive with names identical to the backup files will be overwritten.
/S	Restores files in subdirectories nested below the specified target subdirectory (or the currently logged subdirectory if no target subdirectory was specified on the command line).

Examples

RESTORE A: C:

Restores those files from the backup disk in drive A that originally resided on the currently logged subdirectory.

RESTORE A: C:\ /S /B:06-01-91 /E:13:00:00

Restores files from backup disk in drive A to the root directory of drive C, plus all files below the root directory, except those on the target drive that were modified on or after June 1, 1991, at 1:00 p.m.

Error level Codes

- 0 = RESTORE command completed processing normally
 - 1 = No files were found to restore
 - 3 = Command terminated prematurely with Ctrl-C from operator.
 - 4 = Command terminated prematurely because of some internal error.
-

SHARE

This command will support file sharing and locking.

SYNTAX

SHARE /switches

SHARE command is used on local area network. It will prevent open disk files from being overwritten.

For example, if a file is open on a floppy disk and you switch disks before closing the file, then SHARE displays an error message and temporarily suspends processing until you return the original disk to the drive.

SWITCHES

- | | |
|---------|---|
| /F:nnnn | Allocates space in RAM to be used to store the names of open disk files where <i>nnnn</i> is the size of the storage space in bytes. The default is 2048 bytes. |
| /L:nn | Indicates the number of files that can be opened and locked at the same time. A file is locked when it is opened for reading or writing, and cannot be accessed until it is closed again. The default is 20 locked files. |

Example

SHARE /F:4096 /L:32

This command will activate the SHARE program, allocate 4096 bytes for file name space, and allow a maximum of 32 locked files.

SHARE can also help prevent temporary files created by extended or expanded memory managers from conflicting with those created by application programs.

SMARTDRV

This command loads and analyzes the SMART drive disk-cache system.

SYNTAX

SMARTDRV drive + \drive-... /E:element size winsize /switches

MARTDRV is usually invoked in the AUTOEXEC.BAT file to enable the disk cache for all available drives at startup time. Floppy disk drives and interlnk drives are read-cached but not write-cached; hard disk drive are read-cached and write-cached; CDROM, network drives, compressed drives, and RAM disks are ignored.

SWITCHES

- /B: size** Specifies size of the read-ahead buffer in kilo-bytes. Its value can be any multiple of the size value supplied with the /E switch. Larger values require more conventional memory. Default is 16K.
- /C** Writes all cached information from memory to the hard disk. Use this option before you turn off the computer to make sure all cached data has been written to the disk. When SMARTDRV is in memory, this option is invoked automatically whenever you press Ctrl-Alt-Del, but *not* when you switch-off your computer or press the reset button.
- /E: Element** Specifies the amount of the cache that SMARTDrive moves at one time, in bytes. Valid amounts are 1024, 4096, 2048, and

8192. Default is 8192. Larger values require greater amount of conventional memory for the cache. Use this switch before any values you supply for the *size* and *winsize* parameters.

- /R Clears the existing cache and restarts SMARTDRV.
- /L Forces SMARTDRV to load in to conventional memory. Try using this option if double -buffering is enabled (see *Notes*, below) and your system appears sluggish.
- /Q Disables status and error messages when SMARTDRV loads.
- /S Displays the current status of the cache.

Examples

SMARTDRV a-b- 2048 1024

creates a 2048K cache. It specifies that it will not be reduced by more than 1024K and disables caching on floppy disk drives A and B

SMARTDRV /C

writes cached data to disks.

Notes The purpose of the SMART drive disk cache system is to speed up your system's disk operations. SMARTDRV automatically uses extended memory, provided that you have installed HIMEM.SYS (or a complete extended-memory manager). If the upper memory area is available, SMARTDrive will automatically load into upper memory (unless you specify the /L switch). You do not need to use the LOADHIGH command with SMARTDRV.EXE. If you use EMM386.EXE or run Windows in 386 enhanced mode, you may need to use SMARTDRV's double-buffering feature. To enable this feature include the following command in your CONFIG.SYS file:

DEVICE = SMARTDRV.EXE /DOUBLE_BUFFER

Include a drive and directory path if necessary, to enable DOS to locate SMARTDRV.EXE. The default values for *size* and *winsize* are as follows,

(based on the amount of extended memory in your system):

<i>Extended Memory</i>	<i>Size</i>	<i>Winsize</i>
0-1 Mb	All extended memory	0 (no caching)
1-2 Mb	1024	256
2-4 Mb	1024	512
4-6 Mb	2048	1024
6 Mb-Up	2048	2048

SYS

Copies DOS system files to a new disk.

SYNTAX

SYS source: \path target:

SYS transfers the DOS system files (IO.SYS and MSDOS.SYS), plus the COMMAND.COM, file, to a formatted disk or hard disk drive C:, without requiring reformatting.

You must specify a target drive where SYS is to place the operating system files. Optionally, you may include a source drive and path where DOS can locate the system files, before specifying the target. If you do not specify a source location, DOS looks for the files on the currently logged drive.

Examples

SYS A:

copies system files to the disk in drive A.

SYS C: A:

copies system file to drive A from drive C, even if you are not logged into drive C. The file *SYS.COM* must be available on the currently logged drive or the DOS search path.

Note SYS does not work on drives that have been reassigned using the SUBST command, nor will it work on a network.

SORT

Sorts data in character-based files or sorts the output of DOS commands.

SYNTAX

`SORT /switches < drive: \path\file`

Alternate syntax

`command | SORT /Switches`

The SORT command will produce character-based output in numeric or alphabetical order. It arranges individual lines in text files or each line of output. It is intended to be used on data lists (such as file directories or name lists) in which each line of the file contains some significant piece of information.

SWITCHES

`/R` Sorts in reverse order (Z to A, 9 to 0)

`/+nn` Sorts using a character offset from the start of each line, where *nn* is the number of characters from the beginning.

Examples

`SORT /R /+21 <NAMES.LST> RALPHA.LST`

reads the file NAMES.LST, sorts in the reverse order on the 21st character of each line, and writes the result into a file named RALPHA.LST.

`TYPE DATALIST.TXT | SORT`

sorts the output of the TYPE command, displaying the contents of an ASCII file named DATALIST.TXT in alphabetical order.

SUBST

This command associates a drive letter with a directory path. The Drive letters used this way are called *virtual drives*

SYNTAX

SUBST newdrive: drive:\existing path /switch

To assign a drive letter to a directory, specify the drive letter that you want to use, followed by the directory path name. This drive letter cannot refer to any existing drive letter in your system. The highest default drive letter you can use is E. To use a drive letter higher than E, add the LASTDRIVE command to your CONFIG.SYS, file. If you have added the LASTDRIVE command to CONFIG.SYS you can use any drive letter up to and including the drive letter specified by LASTDRIVE.

The subdirectory path must already exist, and if the drive letter is different from the currently logged drive, it must be specified as part of the existing path parameter.

To display a list of current drive assignments, enter SUBST without parameters.

SWITCHES

/D Deletes a drive letter that has been initialized with SUBST. Do not use the subdirectory path parameter with this switch

Example

SUBST D C:\WORD\USER\AMAR

allows use of drive D in place of C:\WORD\USER\AMAR in all commands that reference this subdirectory.

SUBST D: /D

After invoking the previous example this command deletes drive D as a substitute for C:\WORD\USER\AMAR.

TREE

This command displays the subdirectory structure of a drive.

SYNTAX

TREE drive:\path/switches

/F Includes the file names in each subdirectory.

/A Displays the subdirectory using standard ASCII characters rather than graphic characters; this can speed up printing.

Example

TREE | MORE

displays the subdirectory structure of the currently logged drive and pauses the screen display after each screenful of information.

TREE C: /F /A > PRN

Displays the subdirectory structure of drive C, includes the file names in each subdirectory and sends the output to the standard printing device in ASCII format.

UNDELETE

Recovers accidentally deleted files.

SYNTAX

UNDELETE drive:\path\file(s) /switches

Invoke UNDELETE command with the name of a deleted file. You may use wild-card characters to recover groups of files. If you omit a file name, UNDELETE will attempt to recover all the deleted files it finds. For best results, invoke UNDELETE before any information is written to the disk. Subsequent disk writes

may overwrite the disk area occupied by the deleted file making recovery impossible.

If you do not include a drive or subdirectory path before the file name, the currently logged drive and subdirectory are used.

UNDELETE displays each deleted file it finds that matches the specification in the command line. It prompts you to re-enter the first character in the file name, which was lost when the file was deleted. After you enter the characters, UNDELETE attempts to recover the file.

SWITCHES

/S:drive

Enables *delete sentry* protection and loads the terminate-and-stay-resident (TSR) portion of UNDELETE. The program records information used to recover deleted files on the specified *drive*. If you do not specify a drive, the program records information on the current drive. If you have installed delete-sentry protection, you may use the */DS* switch.

/T drive-entries

Enables *delete tracker* protection and loads the terminate-and-stay-resident (TSR) portion of UNDELETE. The program records information used to recover deleted files on the specified *drive*. If you do not specify a drive the program records information on the current drive. The *entries* parameter specifies the maximum number of entries in the deletion-tracking file, PCTRACKR.DEL. value for this parameter must be from 1 through 999.

The default value of *entries* depends on the type of disk you are tracking. Following are disk sizes, plus default value of *entries*

Disk	Entries
360K	25
720K	50
1.2 Mb	75
1.44 Mb	75
20 Mb	101
32 Mb	202
32 Mb	303

Do not use deletion tracking for any drive that has been redirected using the SUBST command. If you intend to see SUBST you must do so before you install deletion tracking. If you have installed delete-tracker protection, you may use the /DT switch

/ALL	Invokes automatic undeleting and renaming of all specified files. Processing takes place automatically without prompts to the user to rename files. File are renamed using a number sign.(#)as the first character. If duplicate file names could result, UNDELETE supplies one of the following characters, in order, until it creates a unique file name.
/DOS	Forces UNDELETE to use the DOS file directory to locate and recover deleted files. This is the default when delete-tracker and delete-sentry projection do not exist
/DS	Forces DOS to use the delete-sentry directory (if it exists) to locate and recover deleted files.
/DT	Forces DOS to use the delete tracking file (if it exists) to locate and recover deleted files.
/LIST	Lists all deleted files that may be recoverable .
/LOAD	Loads the terminate -and-stay-resident protion of UNDELETE into memory using configuration information in the UNDELETE .INI file. If UNDELETE .INI does not exist, UNDELETE uses default values.
/PURGE [drive]	Empties the delete-sentry directory. If no drive is specified, UNDELETE looks for the directory on the current drive.
/STATUS	Displays the type of delete protection in effect for each drive.
/U	Unloads the terminate-and-stay-resident protion of the Undelete program.

Examples

UNDELETE *.BAK/LIST

lists all deleted files with the extension BAK on the currently logged drive extension BAK.

UNDELETE C:\WORD*.BAK

attempts to recover all files in the C:\WORD subdirectory that have the extension BAK.

- Notes**
- (a) Do not direct the output of UNDELETE to a disk file. You may overwrite the files you are attempting to recover.
 - (b) The results of using UNDELETE will vary from system to system. It is intended for last-resort use only. This utility is not intended to be a substitute for making backup copies of your files.
 - (c) The delete-sentry protection method is the protective of your files. It requires a small amount of RAM (13.5K) and some disk space. It works by moving deleted files to a hidden directory named SENTRY. If you undelete the file, DOS moves it back. The SENTRY directory is limited in size to about 7 percent of your total hard disk space. If the directory fills it, UNDELETE purges the oldest files until space has been freed to accommodate any newly deleted file.
 - (d) Delete tracker is slightly less protective but requires a minimal amount of disk space. It records the location of deleted files in a hidden file PCTRACKER.DEL. You can undelete a file provided that another file has not been subsequently placed in the same location as the deleted one.
 - (e) The DOS directory method require on additional RAM or disk space but cannot undelete files reliably after disk writes.
 - (f) If you do not specify a switch when you invoke UNDELETE, it tries to use delete sentry, followed by deleted tracker. If neither protection method is available, it uses the DOS directory.
 - (g) UNDELETE cannot restore a directory that has been removed, or files that were in a removed directory.
 - (h) UNDELETE uses the UNDELETE.INI file to define values when UNDELETE is used. If the file does not exist when you invoke UNDELETE, it is created.
-

UNFORMAT

You can recover files from an accidental disk format, with the help of this command.

SYNTAX

UNFORMAT drive: /switches

SWITCHES

- /L Lists all files and subdirectories found on the formatted drive
- /P Echoes program messages to the standard printing device
- /TEST Processes, but does not write any changes to the formatted disk

Examples

UNFORMAT C:

restores an accidentally reformatted disk in drive C.

UNFORMAT C: /TEST /L

tests recovery chances on a formatted disk in drive C when a FAT data file does not exist and lists file names found.

Notes The results of UNFORMAT will vary from system to system.

UNFORMAT cannot be used on a network. If you formatted the disk using the /U switch, UNFORMAT cannot restore the disk.

VSAFE

This command monitors the system for any attack of viruses.

SYNTAX

VSAFE /options + | - ... /switches

Invoke VSAFE with one on the following *option* parameters to indicate how the program is to monitor for viruses. Follow the option number with a plus sign (+)

to active, and a minus sign (–) to deactivate.

- /1 Warns of potential hard disk reformat (default: /1+).
- /2 Warns of any program's attempt to remain resident (default: /2-).
- /3 Prevents disk writes (default: /3-).
- /4 Checks executable files on opening (default: /4+).
- /5 Checks disk's boot sectors (default: /5+).
- /6 Warns of attempts to write to hard disk's boot sectors or partition table (default: /6+).
- /7 Warns of attempts to write to floppy disks' boot sector or partition table (default: /7-).
- /8 Warns of attempts to modify executable files (default: /8+).

SWITCHES

- /A *key* Activates hot key, as Alt plus keyboard *key*
- /C *key* Activates hot key, as Ctrl plus keyboard *key*.
- /D Turns off checksum analysis.
- /N Allows network drives to be loaded.
- /NE Does not monitor expanded memory.
- /NX Does not monitor extended memory.
- /U Removes VSAFE from RAM.

Example

VSAFE /2 + /7 + /CV

Loads VSAFE, including all default settings, plus monitoring for any other programs attempt to remain resident in memory. Any attempt of a program to write to any disk's boot sector and activates the VSAFE display screen when the user presses Ctrl-V.

Notes Do not install windows to display VSAFE in RAM if you run Windows

while VSAFE is in RAM, add the following command to your WIN.INI file.

load = wntsrman.exe

WNTSRMAN allows windows to display VSAFE messages.

XCOPY

Selectively copies files.

SYNTAX

XCOPY source:\path\file(s) target: \path\file(s) \switches

At a minimum, the xcopy command requires a source file name, which may include wildcard characters, plus optional drive letter and subdirectory path. You may provide a target parameter as well which may be another file name, drive letter, subdirectory path or combination of the three. If you do not include a target, XCOPY will attempt to copy the source files on to the currently logged drive and subdirectory.

The source and target parameters may not duplicate the same file name and location. In other words, the XCOPY command will not copy a file on to itself.

If you use wildcard characters to indicate multiple source files and the target does not include a file name, copies of each file matching the source specification will be made in the target location.

If you indicate multiple source files and the target file name also includes wildcard characters, DOS will attempt to rename the target files in accordance with the wildcard conventions that you indicate. For Predictable results, keep the wildcard character specification consistent between the source and target file names.

SWITCHES

The available options make XCOPY more flexible than the COPY command

/A Copies only those files matching the source specification that also

- have their archive bit set.
- /D:date** Copies files that were modified on or after the specified date. The exact format of the *date* parameter depends on the COUNTRY setting you are using.
 - /E** Creates subdirectories on the target location, even if there are no files in them. This switch is valid only when used in conjunction with the **/S** switch.
 - /M** Resets (turns off) the archive bit in a file after making the copy.
 - /P** Issues a prompt asking you to confirm the copy of each source file.
 - /S** Copies files matching the source specification that are found in subdirectories nested below the source subdirectory.
 - /V** Performs a verification check against the image of the file in memory.
 - /W** Causes XCOPY to pause before making copies allowing you an opportunity to change disks in the source drive if necessary.

Examples

XCOPY C:\REPORTS*.TXT B:

Copies all files in the C:\REPORTS subdirectory with the extension .TXT to drive B.

XCOPY C:\REPORTS*.TXT B: /S /D: 10/26/93/

copies all files in the C:\REPORT subdirectory, as well as any located in subdirectories nested below C:\REPORTS with the extension .TXT, provided that they have been modified on or after October 26, 1993. The copies are placed on drive B.

- Notes**
- (a) Unlike earlier versions of DOS, XCOPY in DOS-6 does not copy hidden or system files. XCOPY sets the archive attribute on copies it creates, whether or not this attribute was set in the source file.
 - (b) In addition to being more flexible than COPY XCOPY can handle large numbers of files more efficiently, because it reads as many files as it can into memory before writing them to disk. This lessens the number of disk accesses. If you copy lots of smaller files, this can save you time and reduce disk wear and tear.
 - (c) If you use the **/A** and **/M** option switches, XCOPY can copy a group of files that might not fit on a single floppy disk. Wait for the disk

to fillup, replace it with a new disk, and restart XCOPY by pressing F3. Because the /A switch instructs XCOPY to copy only files with the archive bit set and the /M switch updates the archive bit after each file is copied, the earlier copies will not be included on subsequent floppy disks.

- (d) XCOPY has some advantages over DISKCOPY: fragmented source files will be defragmented on the target disk and copy can copy files between disks with different data capacities. However, XCOPY cannot format disk on the fly as DISKCOPY can.

CONFIG.SYS COMMANDS

BREAK

Controls when DOS checks for Ctrl-Break entered by the user.

SYNTAX

BREAK = ON/OFF

The Ctrl-C key Combinations cancel most DOS commands and some application as well. Normally, DOS checks to see if the user entered Ctrl-Break or Ctrl-C only during functions that transmit data to and from the processor. BREAK = ON will cause DOS to check for cancellation during any DOS function call. This allows operating system to cancel processing when commands or applications use very little data input and output.

You should avoid using BREAK = ON if application have their own uses for Ctrl-C. The Default status for BREAK is OFF.

Example

BREAK = ON

allows Ctrl-Break checking during any function.

BUFFERS

sets the number of disk-read buffers.

SYNTAX

BUFFERS = # #,n

where # # is the number of buffers to be used by DOS. The valid range is 1 to 99.

A buffer is an area of memory set aside for temporary data storage. Buffers can speed up system performance by reducing the number of times DOS must directly access the disk. However, each Buffer takes up about 530 bytes of RAM reducing the amount of memory available for processing. Too many buffers will slow down the system.

Because computer systems vary so widely there is no hard and fast rule for determining the optimum number of buffers. DOS creates a default number of buffer based on the size of your RAM.

RAM Size	Default Number of Buffers	Bytes Used
Less than 128K (360K disk)	2	512
Less than 128K larger than 360K disk)	3	512
128-255K	5	2672
256-511K	10	5328
512-640K	15	7984

If you are trying to increase system performance by increasing the number of buffers you might start with the following list.

Hard disk Size (in MB)	Suggested Number of Buffers
20 - 32	20
40 - 80	30
80 - 120	40
120 +	50

The *n* parameter specifies an additional number of *read-ahead buffers*, which store data just beyond the area of the disk being read, where *n* is the number of read ahead buffers. DOS can anticipate up to 8 sectors of information on disk so this number should be set to 8 in most cases. Read -ahead buffers further enhance system speed. Valid range is 0 to 8. Default is zero.

COUNTRY

Installs international characters sets and punctuation conventions.

SYNTAX

COUNTRY = code, page, drive:\path \file.ext

Use the COUNTRY command to start your system with a non United States keyboard and display character set.

The *code* parameter is a three-digit number. If this command is not used, the default country code is 001 (the United States). The country code specifies the time and date formats used by the commands MSBACKUP, DATE, RESTORE, and TIME. The optional *page* parameter is a three-digit number for each code page number in the COUNTRY.SYS file. If this parameter is not supplied, a default is used for each country code.

Following Table lists country codes default and alternate code pages, date formats, and time formats for countries supported by DOS 6.

You can also purchase special versions of DOS that support character sets for the following languages or countries: Arabic. Israel, Japan, Korea, People's Republic of China, and Taiwan.

The COUNTRY.SYS file is the default file for country-specific data. This file must be located on the root directory if the *file* parameter is not used. Include the *file* parameter if you are using a file other than COUNTRY.SYS or if the country-specific data file is not located on the root Directory.

Example

COUNTRY = 002

Installs the French Canadian character set.

COUNTRY = 002,,C:\DOS\COUNTRY.SYS

installs the same character set and specifies that the COUNTRY.SYS file can be found in the C:\DOS directory.

DEVICE

This command installs device drivers.

DOS Country Codes

Country	Code	Default, Alt.Code page	Date Format (Oct. 26,1993)	Time Format (1 p.m.)
Belgium	032	850,437	20/10/1993	13:00:00
Brazil	055	850,437	26/10/1993	13:00:00
Canadian-French	002	863,850	1993-10-26	13:00:00
Czechoslovakia	042	852,850	1993-10-26	13:00:00
Denmark	045	850,865	26-10-1993	13:00:00
Finland	358	850,437	26-10-1993	13:00:00
France	033	850,437	26-10-1993	13:00:00
Germany	049	850,437	26-10-1993	13:00:00
Hungary	036	852,850	26-10-1993	13:00:00
International English	061	437,850	26-10-1993	1:00:00:00p
Italy	039	850,437	26/10/1993	13:00:00
Latin America	003	850,437	26/10/1993	1:00:00:00p
Netherlands	031	850,437	26-10-1993	13:00:00
Norway	047	850,437	26.10.1993	13:00:00
Poland	048	852,850	1993-10-26	13:00:00
Portugal	351	850,860	26-10-1993	13:00:00
Spain	034	850,437	26/10/1993	13:00:00
Sweden	046	850,437	1993-10-26	13:00:00
Switzerland	041	850,437	26.10.1993	13:00:00
United Kingdom	044	437,850	26/10/1993	13:00:00:00
United States	001	437,850	10-26-1993	1:00:00:00p
Yugoslavia	038	852,850	1993-10-26	13:00:00

SYNTAX

DEVICE = Drive:\path file /switches

Use this **DEVICE** command, as per your device driver documentation to load the software program.

Example

```
DEVICE = ANSI.SYS
```

Loads the extended keyboard and screen driver.

Notes Some peripheral device drivers are contained in executable files that may be invoked from the DOS prompt. Be sure that your documentation specifies how your driver file may be located. DOS includes another **CONFIG.SYS** command, **INSTALL**, that permits you to load executable files from within **CONFIG.SYS**.

DEVICEHIGH

Installs device drivers in reserved memory, if space is available.

SYNTAX

```
DEVICEHIGH /switches = drive:\ path\ file.
```

If you include this command in **CONFIG.SYS**, you must have previously loaded the **HIMEM.SYS** device driver using the **DEVICE** command, plus an expanded memory manager that supports the Microsoft Extended memory specification for Upper Memory Blocks (XMS UMB, For Short). An example of such an expanded memory manager would be the **EMM 386.EXE** driver that is supplied with DOS. In addition, you must include the command **DOS = UMB** before using **DEVICEHIGH**. If you have not previously loaded these drivers, this command will function identically to the **DEVICE** command.

Device driver files are normally loaded into conventional memory (0-640K) using the **DEVICE** command. The **DEVICEHIGH** command attempts to load the driver in to reserved memory (640-1024K) if it can find space. Otherwise, the driver file is loaded in conventional memory.

SWITCHES

/L: region 1,
minsize 1;
region 2,
minsize 2...

Specifies regions of upper memory into which to load the program. If this switch is not used DOS loads the program into the largest UMB it finds.

Some programs expand in memory while running. If you are loading such a program, you can also indicate a minimum size for a UMB in the specified region (in bytes). DOS will load the program if it can find a UMB that is larger than the program's load size and the indicated minimum size. Separate the minimum size value from the region number using a comma.

/S

Shrinks the UMB to its minimum size while loading. This switch helps maximize use of upper memory. You can use this switch only if you are also using the /L switch to specify a minimum size for UMBs.

Examples

Use the following sequence of commands before using DEVICEHIGH (these examples assume that the driver files are located on the C:\DOS directory)

```
DEVICE = C:\DOS\HIMEM.SYS
DEVICE = C:\DOS\EMM386.EXE RAM
DOS = UMB
```

After using this sequence the following syntax is valid:

```
DEVICEHIGH = C:\DOS\SETVER.EXE
```

which loads the MEMMAKER command to optimize your memory usage. MEMMAKER may add switches similar to the following:

```
DEVICEHIGH /L:1,12048 = C:\DOS\SETVER.EXE
```

Notes The DOS 5 syntax for DEVICEHIGH will still work with DOS 6, but it is not recommended.

DRIVPARM

This command modifies disk drive parameters.

SYNTAX

DRIVPARM = /D:drive /switches

The DRIVPARM command requires that you specify a physical drive connected to your system, using the /D: switch followed by a number indicating which drive is being reconfigured. Numbers are in the range 0-255, where 0 is drive A, 1 is drive B, 2 is drive C and so forth. After specifying the drive to be reconfigured, use other switches to indicate the new configuration for the drive.

SWITCH

- /C Indicates that the drive is capable of detecting whether the drive door has been opened and closed.
- /F:type Specifies the drive type, where type is a number indicating the drive type. Valid values for type are:
 - 0 = 180K or 360K (also 160K or 320K)
 - 1 = 1.2 MB, 5.25"
 - 2 = 720K, 3.5"
 - 5 = Hard disk
 - 6 = Tape drive
 - 7 = 1.44Mb, 3.5"
 - 8 = Read/Write Optical Disk
 - 9 = 2.88Mb, 3.5"

The default for the drive parameter is 2
- /H:head Specifies the number of read/write heads where head is a number in the range 1-99.
- /I Specifies a 3.5" floppy disk drive installed on your computer if your system's ROM BIOS does not support 3.5" drives.
- /N Specifies a non-removable drive.

- /S: sec- Specifies the number of sectors per track, where sectors is a number in the range 1-99
- /T:track Specifies the number of tracks per side where track is the indicated number.

Example

DRIVPARM = /d:4 /f:6 /h:1 /s:80 /t:16

Specifies that Drive E is tape drive, uses 1 head, reads 80 sectors per track and 16 tracks

Note DRIVPARM is used to override the default setting for data storage device installed on your system. It should be used with special care since, invalid parameters will render drives unusable. Use this command in case where a device is non-standard or the drivers default configuration does not support the intended media type. For example, you can use a 720 KB floppy drive, which is a non standard type using DOS 6 DRIVPARM Command.

DOS

Loads the operating system in conventional extended, or reserved memory.

SYNTAX

DOS = high/low, umbl, noumb

If you include this command in CONFIG.SYS you must have previously loaded the HIMEM.SYS device driver using the DEVICE command. The UMB parameter is also required to use the DEVICE HIGH and LOADHIGH command.

Use the HIGH parameter to load DOS into extended memory. By loading DOS in extended memory (that portion of RAM starting at 1024K), you can free a significant amount of system RAM for application software. You must have sufficient extended memory installed in your system to take advantage of this feature.

Use the LOW parameter to load DOS in *conventional memory* (memory between 0K and 640K). This is the default location for DOS if you do not include

this command in CONFIG.SYS.

If you include the optional UMB parameter, DOS will attempt to load as much of itself as it can into *reserved memory* (that portion of RAM between 640K and 1024K). Any remaining part of the operating system will be loaded into memory as indicated by the HIGH or LOW parameter.

However the UMB parameter is valid only if you have loaded an expanded memory manager that supports the XMS UMB allocation routines used by DOS. For example, the EMM386.EXE driver supplied with DOS. If you have not previously loaded such a driver, the UMB parameter has no effect.

You can force DOS to ignore upper memory blocks by specifying the *noumb* parameter in place of the umb parameter.

Examples

DOS = HIGH,UMB

loads DOS into reserved memory, with any remainder placed in extended memory.

DOS = LOW,UMB

loads DOS into reserved memory, with any remainder placed in conventional memory

Notes This command is available only on 80386 or 80486 machines and some advanced 80286 machines that are capable of mapping extended and reserved memory.

If you specify DOS = HIGH and DOS is unable to find or use the high memory area, it will display the following message:

HMA not available

Loading DOS low

FCBS

Specifies the number of open file using control blocks.

SYNTAX

FCBS = maximum,open

The FCBS command is used primarily with networking schemes that control the number of open files by means of *file control blocks*, which are pointers to the location of open files on disk. Include this command in CONFIG.SYS if you are using a network, the SHARE command or software that manages open files by this method.

The *maximum* parameter indicates the maximum number of open file control blocks, from 1 to 255. Default is 4.

The *open* parameter indicates the number of files that will not automatically close if processing attempts to open more files than allowed by the maximum parameter. If processing attempts to open more files than allowed by the FCBS command, DOS displays an error message.

Examples

FCBS = 48,8

specifies a maximum of 48 open file control blocks, with up to 8 files protected from automatic closing if processing attempts to open more than 48.

FCBS = 1,1

sets the maximum number of file control blocks to 1.

FILES

Sets the maximum allowed number of simultaneously opened files.

SYNTAX

FILES = n

The *n* Parameter indicates the maximum number of concurrently open files. Default is 8; maximum numbers is 255. If you exceed the maximum number of open files during processing, DOS displays the message "Too may files are open".

Example

FILES = 25

indicates that a maximum of 25 files may be open at one time.

Note Each increment to this parameter decreases the amount of RAM available to application by 128 bytes. Therefore it serves no purpose to set this parameter any higher than the maximum possible number of files for your application.

INCLUDE

Invoke a series of CONFIG.SYS commands from another section of the file.

SYNTAX

INCLUDE = block

Use the INCLUDE command with a CONFIG.SYS file that contains multiple configurations. In a multi-configuration CONFIG.SYS file, you can isolate and identify any series of commands that might be used in more than one configuration.

Examples

Following is an example of a simple block of configuration commands that might appear in a CONFIG.SYS file. Notice that the configuration block name appears within brackets:

[expanded - mem]

DEVICE = C:\DOS\HIMEM.SYS

DEVICE = C:\DOS\EMM386.EXE RAM

[exp - ramdisk]

INCLUDE = expanded-mem

DEVICEHIGH = C:\DOS\RAMDRIVE.SYS 1024/X

Once this series of commands is so identified with configuration block

names, a multiple configuration file that accesses the commands in the *exp-ramdisk* configuration block will access the commands in the *expanded-mem* block as well.

Note When first setting up your multiple configuration file, it may be easier to list all commands without using INCLUDE until the file is running properly. Later, you can condense the CONFIG SYS file by gathering the duplicate command lines into a separate block and referencing that block with an INCLUDE command.

INSTALL

Loads terminate -and -stay-resident (TSR) software.

SYNTAX

INSTALL = [drive:\path\]file,ext

Terminate and stay resident (TSR) programs are normally loaded by means of executable file at the DOS prompt. The INSTALL commands let you load TSR programs at the earliest point in the power-on process. This can help reduce conflicts by loading such programs in areas of memory where they are least likely to cause RAM addressing conflicts with other application. Include a drive letter and subdirectory location if the executable file does not exist on the root directory.

Four DOS external commands may be loaded this way: FASTOPEN.EXE, KEYB.COM, NLSFUNC.EXE, and SHARE.EXE.

Example

INSTALL = C:\DOS\SHARE.EXE

installs the SHARE command from the file located on the C:\DOS subdirectory.

Notes This command speeds up installation and minimizes addressing problems, but it will not prevent interrupt conflicts between TSR programs

and application. Some TSR program permit you to unload them if they cause conflicts; in other cases, you may have to chose not to install TSR programs that cannot coexist with other software

LASTDRIVE

Specifies the largest logical-drive letter to be used by the system.

SYNTAX

LASTDRIVE = drive

The *drive* parameter is a letter from A to Z. The colon is not in this syntax.

Example

LAST DRIVE = H

Sets a maximum of 8 logical drive letters.

Notes DOS will set the highest drive letter automatically. You only need to use this command if your processing requires additional "dummy" logical drive letters, that is more than the amount for which your system is configured. Each additional drive letter over E takes up 81 bytes of RAM. You can save some memory by setting no more than your actual upper limit of drive letters.

MENUCOLOR

Specifies text and background colors for configuration menu.

SYNTAX

MENU COLOR = text background

The **MENUCOLOR** command is used in a multiple-configuration **CONFIG.SYS** file to specify the text and background colour of the screen while menu block is active. The *text* Parameter is required. The *background* parameter is optional. The parameter are supplied as integers in the rang 0-15, according to the following color codes.

Code	Color	Code	Color
0	Black	8	Gray
1	Blue	9	Bright Blue
2	Green	10	Bright Green
3	Cyan	11	Bright Cyan
4	Red	12	Bright Red
5	Magenta	13	Bright Magenta
6	Brown	14	Yellow
7	White	15	Bright White

Example

MENUCOLOR = 0,6

sets menu text, as black on a brown background.

Note You can experiment to determine which colors you prefer on your system, but do not make the text and background the same, or the menu will not be visible.

MENUDEFAULT

Specifies a default configuration block and optional timeout value for accessing the default.

SYNTAX

MENUDEFAULT = block, timeout

Use this command within a menu block in a multiple-configuration **CONFIG.SYS**

file. The *block* parameter is required, and must be the name of a block of configuration commands that are identified elsewhere in CONFIG.SYS. The *timeout* parameter is an integer in the range 0-90, indicating the number of seconds DOS will display the menu before automatically selecting the default.

Example

```
MENUDEFAULT = base, 15
```

Indicates that the default is a block of commands identified elsewhere as *base* and that DOS will wait 15 seconds before automatically selecting this configuration block.

MENUITEM

Identifies a block of CONFIG.SYS command to be included in a configuration menu.

SYNTAX

```
MENUITEM = block, text
```

Use the MENUITEM command to identify available choice in a configuration menu in your CONFIG.SYS file. The *block* parameter is required and specifies a block of configuration commands identified elsewhere in CONFIG.SYS. This block will be accessed if the user selects the indicated menu item. The *text* parameter is optional. It is a prompt that is displays in the menu, detailing to the user the type of configuration that will be accessed if this menu item is selected. The prompt may be up to seventy characters long.

Examples

The following example is a menu block with three menu items:

```
[menu]
MENUITEM = rdisk1, RAM disk (1024K)
MENUITEM = rdisk2, RAM disk (2048K)
```

MENUITEM = nordisk, No RAM disk

Assume that your CONFIG.SYS file contains configuration blocks named *rdisk1*, *rdisk2*, and *nordisk*. This menu block will then cause DOS to display the following menu when you start your computer.

MS-DOS 6 Startup Menu

1. RAM Disk (1024)
2. RAM Disk (2048)
3. No RAM Disk

Enter a choice:

Notes you may include up to nine menu items in a single configuration menu. If the specified *block* parameter does not exist in the CONFIG.SYS file, the menu item will not be included in the menu and cannot be selected. DOS automatically assigns numbers to menu items and displays them in the order they appear in the menu block. Unless otherwise specified with the MENUDEFAULT command, menu item, number 1 is the default configuration.

NUMLOCK

Turns the keyboard's numeric keypad on or off at startup time.

SYNTAX

NUMLOCK = ON/OFF

Use the command within a menu block in a multiple configuration CONFIG.SYS file. If set to ON, DOS turns the numeric keypad on when the menu is displayed. If set to OFF, DOS turns the numeric keypad off.

Example

NUMLOCK = ON

ensures that the keypad is on as the menu appears.

REM

Indicates a comment line to be ignored by DOS.

SYNTAX

REM [command]

The REM command allows you to place comments in CONFIG.SYS file for documenting.

Examples

REM HIMEM.SYS (when the REM preceding DEVICE =is removed):
REM DEVICE = C:\DOS\HIMEM.SYS

The first two lines are simple comment. On the third line, the REM command blocks loading of the HIMEM.SYS driver.

SHELL

Installs an alternate COMMAND.COM file and changes the environment size

SYNTAX

SHELL = [drive:\path\] COMMAND.COM [/switches]

DOS looks for COMMAND.COM in the root directory of the drive used to load the operating system (drive C on many hard-disk-systems or drive A on floppy-disk systems). Use the SHELL command to indicate a different location for COMMAND.COM. For example, you might put COMMAND.COM on a RAM disk to

increase performance speed and reduce disk changes on systems without a hard disk.

SWITCHES

- /P** Loads the specified COMMAND.COM as the primary processor. Without this parameter, the, specified COMMAND.COM is loaded as a secondary processor, and the EXIT command will return to the COMMAND.COM that was initially loaded.
- /E:nnn** Indicates the size of the environment space, where *nnn* equals, the size of the environment space in bytes; for example, 512 to indicate 512 bytes.

Example

`SHELL = D: COMMAND.COM /E:512 /P`

loads the copy of COMMAND.COM on drive D as the primary processor, and increases the size of the environment to 512 bytes.

STACKS

sets dynamic allocation of stack space.

SYNTAX

`STACKS = frames, size`

Dynamic stack space allocation permits multiple interrupt calls to call each other without crashing the system.

The *frames* parameter sets the number of stacks frames. Default is 9, except for IBM-PC, XT, or portable machines, where the default is 0. Valid numbers of frames are from 8 to 64. The *size* parameter indicates the size of each frame. Default is 128 except for IBM-PC, XT, or portable machines, where the default is 0.

Valid frame sizes are from 32 to 512 bytes.

Examples

STACKS = 18,128

Increases the dynamic stack capacity to 18 frames, 128 bytes each.

STACKS = 0,0

turns off dynamic stack allocation.

Note This command is generally not required, unless your application documentation calls for it. You conserve memory on systems with tight RAM requirements by settings the STACKS parameters to 0. Increase number of stack frames if you see the messages "Stack Overflow" or Exception error 12".

SUBMENU

Specifies a submenu of additional choice within a menu block.

SYNTAX

SUBMENU = block, text

The SUBMENU command is used within menu blocks in a multiple -configuration CONFIG.SYS file. The block parameter is required and must be the name of a menu block defined elsewhere within the CONFIG.SYS file. The menu will be displayed if the user selects the indicated submenu. The *text* parameter is optional. It is a prompt that is displayed in the menu, detailing to the user what submenu will be accessed if this menu item is selected. The prompt may be up to seventy characters long.

Example

SUBMENU = all menu, additional configuration

will display an option to select a submenu block named *alt-menu* (provided it is defined in CONFIG.SYS) with the prompt, "additional configurations."

Notes Submenus are useful if you have more than nine possible configuration since any one configuration menu may have a maximum of nine possible choices. They may be useful in complex configuration where a hierarchical organization of prompt is desirable.

SWITCHES

Allows backward compatibility from 101-key keyboards, control movement of the WINA20.386 file from root directory, and control of DOS startup options.

SYNTAX

SWITCHES = /switches

Use the SWITCHES command with one or more of the available switch parameters to control various startup options.

SWITCHES

- /K Causes the keyboard to emulate an order style, 84-key keyboard on system with order programs that cannot recognize some of the keys on an enhanced 101-key keyboard.
 - /N Disables function keys F5 and F8. When you include this switch you cannot bypass startup commands.
 - /F Disables the timed delay after displaying the message "starting MS-DOS.....". Use this switch to save a little time if you have also used the /N switch
-

Appendix G

BATCH FILE COMMANDS

The batch file command descriptions in this section enable batch files to make choices, perform repetitive tasks, call subroutines, and operate in various ways on optional parameters.

@

Suppresses the display of the line on the screen.

SYNTAX

@command

Command lines that include the @ symbol are processed normally, but are not displayed. This symbol must be the first character in the line.

Examples

```
@ECHO OFF  
DEL C:\BOOK\*.BAK  
XCOPY C:\BOOK\*. A:/M/S
```

suppresses the display of the ECHO OFF command.

Note The @ symbol is related to the ECHO OFF command. While ECHO OFF will prevent the display of all subsequent lines. This symbol prevents the display of only the line in which it appears. For this reason it is most often used with ECHO OFF to prevent that particular command from appearing on the screen.

|| **:(COLON)**

Indicates a section label in a batch file for use by the GOTO command.

SYNTAX

:label name

In general, the legal characters for label names are the same as the legal characters for DOS file names, the one exception being that the period (.) is not used. Labels allow DOS to jump to any line in a batch file, using the GOTO command to reference a label positioned just before the target line.

Examples

```
:START  
IF NOT EXIST C:\BOOK\*. * GOTO END  
DEL C:\BOOK\*.BAK  
XCOPY C:\BOOK\*. * A:/M/S  
:END
```

will skip the DEL and XCOPY commands if there are no files on C:\BOOK (or if C:\BOOK doesn't exist) by jumping to the END label.

|| **CALL**

This command invokes a second batch file from within a currently running batch file, then returns to the original batch file.

SYNTAX

CALL [drive:\path\] batch file

CALL requires the name of another batch file. The .BAT extension is not required. You may include a drive letter and directory path if not the currently logged one.

Examples

```
@ ECHO OFF
CALL WP
DEL C:\BOOK\*.BAK
XCOPY C:\BOOK\*. A:/M/S
```

This will call WP.BAT, then returns to the batch file and invokes the remaining lines.

CD OR CHDIR

Displays or changes the currently logged sub directory.

SYNTAX

CD drive:\path..

CHDIR Drive :\path..

The CD command is a short version of the CHDIR command; they both do the same thing. If you invoke the CD command with the name of a valid sub directory on the current drive, DOS logs that sub directory as the default. If you include a drive letter that is not the current drive, DOS logs the sub directory on the specified drive as the default, but does not change the currently logged drive and path.

If you invoke CD without options, DOS displays the currently logged Sub directory.

You can log onto a sub directory that is nested on the next deeper level by invoking CD followed by the sub directory name.

SWITCH

Logs into the sub directory nested just above the current one, if any

Examples

The following sequence of commands assume that your drive contains a sub directory path \DOS \TEXT.

```
CD\DOS\TEXT
```

logs the \DOS\TEXT sub directory as the default on the current drive.

```
CD..
```

Logs in to the \DOS sub directory which is one level above \DOS\TEXT. Note the .. after CD.

```
CD TEXT
```

Logs back down to the \DOS\TEXT sub directory if you are in the \DOS Sub directory.

```
CD
```

displays C:\DOS\TEXT.

CHCP

This command changes or displays the current *code page*, which contains a Language-specific character set used by DOS.

SYNTAX

CHCP Code page number

CHCP may be used to change the current code page by indicating a number corresponding to a valid code page set stored in the system, using the COUNTRY

command in CONFIG.SYS. Here are example of valid code page numbers:

437	United States
850	Multilingual
852	Slavic

CHCP invoked without options displays the currently active code page.

Only one the code page may be active at any one time, although you may prepare as many as you need.

Examples

CHCP

Displays the current code page (437 on most U.S systems.)

CHCP 863

Changes the code page to the Canadian-french symbol set, provided that set is prepared for use by your system

Notes Code pages are the means by which DOS supports multiple languages. The characters are translated from the code page table and displayed on the screen. In order to use an alternate code page, you must first prepare the code page table for use by your system.

CHOICED

This command prompts the user for a response and sets the ERROR LEVEL variable based on the response given.

SYNTAX

CHOICE /switches prompt

The CHOICE command allows batch files to be interactive. It allows you to write batch files that are more flexible and "intelligent" choosing between alternate processing based on user input. CHOICE displays a prompt and waits for the user to press a key in response. Switches give you the option of specifying which keys are valid response and allowing an automatic default response if none is given

after a specified number of seconds.

The *prompt* parameter is a text string that the CHOICE command displays to the user. If you omit this parameter, CHOICE displays a default prompt based on the switches you have supplied.

SWITCHES

<i>/ C: keys</i>	Specifies the valid response keys, where <i>keys</i> is a character string representing the keys the user may press.
<i>/N</i>	Suppresses display of the valid response keys.
<i>/S</i>	Forces response keys to be case-sensitive. Upper- and lowercase characters may be used in the <i>/C: keys</i> switch. Default is non case-sensitive.
<i>/ T:key,seconds</i>	Pauses for the number of seconds specified by <i>seconds</i> and if no response is given, accepts the character specified by <i>key</i> as the default response. The <i>key</i> parameter must be a key specified in the <i>/C:keys</i> switch. The <i>seconds</i> parameter is a number in the range 0-99. If 0, CHOICE does not pause.

Examples

The following example offers the user a simple *yes* or *no* choice and defaults to No (ERRORLEVEL 2) if no response is given after 15 seconds:

```
@ ECHO OFF
CHOICE /T:N,15 "Delete BAK files on C:\BOOK first"
IF ERRORLEVEL ==2 GOTO MORE
IF ERRORLEVEL ==1 DEL C:\BOOK\*.BAK
:MORE
XCOPY C:\BOOK\*. * A:/M/S
```


Error Level Codes

The ERRORLEVEL values returned by choice depend on the number of valid responses you have specified with the /C:keys switch. The first key in the string returns a value 1, the second 2, the third 3, and so forth. If the user presses Ctrl-C, CHOICE returns an ERRORLEVEL value of zero. If an error occurs while choice is paused, it returns an ERRORLEVEL, value of 255.

CLS

Clears the screen

SYNTAX

CLS

The CLS command is invoked without parameters. It will erase all characters on the screen and display the operating system prompt, if any on the first line on the display.

COPY

Copies and combines files.

SYNTAX

COPY source:\path \file (s) target:\path \file (s) /switches

Alternative syntax for combining files:

COPY source file(s)+sourcefile(s)+...target \path \file(s)/switches

SWITCHES

- /A Indicates that the files are to be treated as ASCII files.
- /B Indicates that the files are to be treated as binary files.
- /V Instructs DOS to perform a validity check on the target files after they are copied.

Examples

COPY B: *.* A:

Copies all files on the currently logged drive and sub directory to drive A. DOS ignores end-of-file characters. Remember to include the colon after the drive letter. If you forget, all the files on the currently logged drive and sub directory will be copied into one file named A.

COPY A: *.TEX *.BAK/A /V

Copies all files with extension TEX to file with the same name and extension. BAK. DOS honors end-of-file characters in all files, appends an end-of-file character on each new file it creates, and verifies the copies that are made.

COPY B: *.TXT \BACKUP/V

Copies all files with extension TXT to a sub directory named BACKUP on the same logged drive. All files are treated as binary files, and DOS verifies the copies that are made.

COPY A: *.TXT.

copies all files on drive A with the extension TXT to the currently logged drive and sub directory. The currently logged drive must not be drive A.

COPY START.FIL + MIDDLE.FIL + END.FIL COMPLETE.FIL

Combines START.FIL, MIDDLE.FIL and END.FIL in to one file called COMPLETE.FIL.

COPY/A: LETTER.TXT PRN

Copies a file to the standard printer. Be sure your printer is on line. If not, press the on line button on the printer.

CTTY

Redirects console input and output to a named hardware device. When console input and output is redirected, the computer can operate on instructions and display messages using a remote input/output device.

SYNTAX

CTTY device name

CTTY requires a valid hardware device name. Common secondary device names include CON (default console), PRN, LPT1, LPT2, LPT3, (Printer ports), COM1, COM2, COM3, and COM4 (Serial communication ports), and AUX, (another terminal connected to the computer.)

Examples

CTTY COM 1

Instructs DOS to handle subsequent input and output through the COM 1 communications port.

CTTY CON

Redirects input functions through the default device (usually the keyboard and monitor). This command must be sent from whatever input device is selected.

DATE

Displays or sets the system date.

SYNTAX

DATE date

If you invoke the DATE command without parameters, DOS displays the current system date and prompts you to enter another. Dates are accepted using the format *mm/dd/yy*, where *mm* is the month (1-12), *dd* is the day (1-31) and *yy* is the year from 1980 to 2079(80-79).

Some alternate formats are accepted. You may use hyphens (-) rather than slashes (/) to separate the month, day and year. You may also use 4 digits for the year (1980-2079)

Examples

DATE

displays the current date and prompts you to enter another. To leave the date unchanged, press enter.

DATE 10-26-93

changes the date to October 26,1993.

DEL OR ERASE

Erases data or deletes files

SYNTAX

DEL drive:\path\file(s) /switches

ERASE drive: \path\file(s) /switches

DEL command requires the name of a file to delete. You can use wildcard characters to erase groups of files. You may also specify a drive letter and sub directory path, to delete files. If you specify a sub directory path without file names, DOS 6 assumes that you want to delete all the files in the Sub directory. In this case, DOS will ask you:

All file in directory will be deleted! Are you Sure (Y/N)?

If you really intend to delete all the files, enter Y in response to this prompt. If you enter N, the command is cancelled.

SWITCH

/P Instructs DOS to display each file that matches the file name parameter and prompts, "Delete (Y/N)?" If you enter Y, the file is deleted.

Examples

DEL EXAMPLE.TXT

deletes the file EXAMPLE.TXT.

DEL *.BAK

deletes all files on the current sub directory with the extension. BAK.

DEL A:

deletes all files in the root directory on drive A. Prompts for confirmation first.

DEL C:\BACKUP*.BAK/P

displays each file of the C:\BACKUP sub directory with the extension .BAK, and prompts for confirmation before deleting it.

DIR

Displays a list of files in a directory.

SYNTAX

DIR drive:\path\file(s)/switches

DIR will display a list of files in the currently logged drive or its Sub directory. You may specify a drive or sub directory other than the current one by specifying it on the command line.

SWITCHES

/P Displays files screen by screen. Press any key to continue

displaying files in this manner, until DOS reaches the end of the list.

/W File names and extensions are listed, in a wide format with as many as five file names per line.

/S Displays files in all subdirectories nested below the specified directory.

/B Displays file and directory names only.

/L Displays file names in lowercase.

/C Displays the compression ratio (files on Dblspace-compressed drives). This switch has no effect when used with **/W** or **/B**.

/O:order List files in sorted order where *order* is a letter indicating the one of the following.

C = by compression ratio, low to high

D = Chronological order

E = File extension, then by name.

G = Group file by subdirectories

N = File name, then by extension

S = File size

To reverse the selected order, place a hyphen (-) before the *order* parameter.

/A:attrib Includes only those files with specified attributes, where *attrib* is a letter indicating the type of attribute to include in the listing:

A = File with archive bit set

D = Directories only

R = File marked read-only

H = Hidden files

S = System files

To reverse the meaning of the attribute, precede the *attribute* letter with a hyphen (-); for example, **-A** would indicate to include files *without* the archive bit set.

Example

DIR A:

Lists all the files on drive A.

DIR C:/P/W

lists all the file on the currently logged sub directory of drive C, in wide format (names only) and pauses the display each time the screen fills up with file names.

DIR /O:N /A:H

displays only hidden files in alphabetical order.

ECHO

suppresses or displays batch file lines on the screen.

SYNTAX

ECHO on/off message

The purpose of the ECHO command is two fold:

- (a) To avoid cluttering up the screen with unwanted command displays
- (b) To display custom message on the screen to the user

If you involve ECHO ON, DOS will display each subsequent line on the screen as it is executed. If you invoke ECHO OFF, the line display is suppressed. If you invoke ECHO without parameters, DOS displays a message indicating the current echo status.

If you invoke ECHO with many other character string, DOS will display the message on the screen, regardless of whether ECHO has been set ON or OFF.

You can use the ECHO command to skip a line on the display. To do so, use the following line.

ECHO

Which has the effect of displaying a null string. Notice that there cannot be any space between the ECHO command and the period.

Examples

```
@ ECHO OFF
ECHO loading word processor....
CALL WP
ECHO deleting BAK files before data backup
DEL C: %1\*.BAK
XCOPY C:%1 *.* A: /M /S %2
```

displays the message "loading word processor".... and "Deleting BAK files before data backup..." Before each command line. The command lines themselves are not echoed to the screen.

Notes ECHO may be used to redirect character strings to a disk file for printer. This technique will work in batch files as well as from the DOS prompt.

For example:

ECHO ^L > PRN

will send a form-feed to most standard printers, where ^L is Ctrl-L not the caret (^) followed by L. You cannot display a pipe or redirection character using ECHO.

FOR

Allows DOS to execute a command repeatedly.

SYNTAX

FOR %% variable IN (dataset) DO command [variable]

The FOR command creates a condition called a *loop*, in which a single command is executed on a series of file parameters, until, all parameters in the series are exhausted. In the above syntax, *dataset* is the series of parameters, % % *variable* is a symbol to be applied sequentially to each item in the data set and *command* is the DOS command to execute repeatedly, using each updated value for % % *variable*.

In other words, if this syntax were translated into plain English, it would read, For item in the indicated list, invoke the command, until you run out of items.

The IN and DOS keywords are a required part of the FOR command. They must be positioned in the command line as shown.

For simplicity's sake the % % *variable* name is usually a single letter, such as A or X. Do not use numbers as variable names, as DOS will mistake these for replaceable command line parameters. Variable name are case-sensitive. Do not mix % % A and % % a in the same command line.

The *dataset* parameter is always enclosed within parameters. If the *dataset*

parameter includes file names, wildcard characters can be used; every file that matches the specification will be included in the data set. For example, (*.*) would be a data set containing every file not the currently logged drive and directory.

Examples

```
@ECHO OFF
FOR % %X IN (*.BAK *.OLD) DO DEL % %X
FOR % %X IN (*.*) DO IF NOT EXIST A: % %X COPY
% %X A:
```

deletes all the files with .BAK and .OLD extensions. Then it copies each file in the current directory to drive A, if that file doesn't already exist on drive A. In other words the second FOR loop copies only newly created files, skipping those that were copied previously.

Notes You can create a loop that moves through a list and executes a commands without using the variable. For example:

```
FOR % %A IN (1 2 3 4 5 ) DO DIR /W
```

executes the DIR/W command exactly 5 times.

Although used most often in batch files, you may invoke the FOR command from the DOS prompt.

GOTO

Redirects batch processing to the line immediately following the specifies label.

SYNTAX

GOTO label

The GOTO command allows different portions of the batch file to execute selectively. By combining labels, which are string preceded by a colon, with GOTO commands, you can cause batch files to *branch* (skip over or execute specific lines

depending on circumstances defined on other commands) or loop. For example, GOTO is often used with the IF command to jump to a specific set of commands when a particular logical condition is true.

Examples

```
@ ECHO OFF
IF NOT EXIST C:%1\*. * GOTO ERROR
DEL C:%1\*. BAK
XCOPY C:%1\*. * A:/M /S
GOTO END
:ERROR
ECHO directory not found or empty. Please try again.
:END
```

IF

Tests to determine if a particular condition is true. If the condition is true, executes a command otherwise, ignores the command.

SYNTAX

To test a logical condition:

IF condition command

or:

IF NOT condition command

To test for the existence of a file:

IF EXIST file (s) command

IF NOT EXIST file (s) command

The *condition* parameter takes the form of an *equality test*, which compares two strings on the command line using two equal signs (= =). For example:

IF "%1" = = "/A" command

tests to see if the first parameter on the command line is /A. If it is, the condition is evaluated as true and the *command* following the condition is executed. If the parameter is anything other than /A, the condition is false and the command is ignored.

Examples

Listing given on the next page demonstrates several uses of the IF command. Line 2 causes processing to jump to the NODIR label if the operator failed to enter any parameters on the command line. Line 3 causes processing to jump to the ERROR label if the operator entered a nonexistent directory path or if no files were found. Line 4 will delete files with a BAK extension, if any exist (thereby avoiding the confusing "File not found" message). Lines 6-10 test all possible values of the ERRORLEVEL variable and display an appropriate message in each case. The labels and GOTO commands assure that the batch file always branches to the appropriate executable lines.

```
@ ECHO OFF
IF "%1" = "" GOTO NODIR
IF NOT EXIST C: %1\*. * GOTO ERROR
IF EXIST C:%1\*. * BAK DEL C:%1\*.BAK
XCOPY C:%1\*. * A: /M /S
IF ERRORLEVEL = 5 ECHO Command aborted.
IF ERRORLEVEL = 4 ECHO Invalid syntax, or insufficient memory.
IF ERRORLEVEL = 2 ECHO Ctrl-C detected.
IF ERRORLEVEL = 1 ECHO No files were found to back up.
IF ERRORLEVEL = 0 ECHO XCOPY completed normally.
GOTO END
:NODIR
ECHO Please specify a sub directory path.
GOTO END
:ERROR
ECHO directory not found, or empty. Please try again.
:END
```

A batch file that demonstrates the use of IF

MD OR MKDIR

This command creates a new directory.

SYNTAX

MD drive:\path directory

MKDIR drive:\path directory

MD requires that you provide a sub directory name on the command line. If the sub directory name is preceded by a backslash (/) it will be created one level below the root directory. If the name is preceded by a space it will be created one level below the currently logged sub directory.

If you include an existing sub directory path, the new sub directory will be created one level below the indicated path. If you include a drive letter the sub directory will be created on the existing drive.

Examples

MD TEXT

creates a sub directory named TEXT one level below the currently logged Sub directory.

MD \TEXT

creates a sub directory named TEXT one level below the root directory.

MD \DATA \TEXT

creates a sub directory named TEXT one level below the DATA sub directory if the DATA sub directory already exists.

MD C:\DATA\TEXT

creates a sub directory named TEXT one level below the DATA sub directory on drive C, if C:\DATA already exists.

PATH

This command specifies a list of sub directories (the *search path*) where DOS is to look for executable program files.

SYNTAX

PATH drive:\path : drive:\path...

If invoked without parameters, PATH displays the current search path, if any. If you want to create or change the search path, invoke PATH followed by a list of the drives and sub directories where you want DOS to look for program files. Drive letters must be followed by colons. Sub directory names must be preceded by a backslash(\).

If you do not include a drive letter, DOS will assume that the sub directory is on the currently logged drive. Otherwise, it always looks for the sub directory on the specified drive.

The entire PATH command can include up to 127 characters.

Example

PATH

displays the search path or the message "No path" if not found.

PATH:

Clears all search path settings and instructs DOS to search only the current directory .

PATH C:\DOS;C:\WORD;C:\LOTUS;C:\SYS;C:\

instructs DOS to look for program files one drive C: on sub directories \DOS,\WORD,\LOTUS;\SYS; and the root directory.

PATH \DOS;\WORD;\LOTUS;\SYS;\

instructs DOS to look for program files on the same set of sub directories as the previous example; however, DOS will look for them on whatever drive is currently logged.

Note The PATH command creates a search path for program files only. Program files have the extensions. EXE, COM, or SYS.

PAUSE

Pauses batch file processing and waits for the operator to press a key before continuing .

SYNTAX

PAUSE message

The PAUSE command is useful when you would like to give the operator a chance to read a long message or to cancel the batch file before continuing.

When the PAUSE command is invoked it displays the following message:

Press any key to continue...

If the user presses a key, the batch file continues. If the user presses Ctrl-C, DOS will prompt for the user to confirm cancellation before cancelling batch processing .

The *message* parameter may be any character string. However, the *message* parameter will appear on the screen only if ECHO is set on and will include the PAUSE command itself, followed by the "press any key" message. If ECHO is OFF, only the "Press any key" message appears.

You may customize the PAUSE message by preceding PAUSE with the ECHO command, echoing your extended message, then redirecting the PAUSE output to NUL. Following program illustrates this point.

```
@ECHO OFF
```

```
CLS
```

```
ECHO will delete BAK files in, then back up, C:\BOOK.
```

```
ECHO press a key to continue, or Ctrl-C to cancel  
the command.
```

```
PAUSE > NUL
```

```
DEL C:\BOOK\*.BAK
```

```
XCOPY C:\BOOK\*. * A: /m /s
```

Above listing shows a batch files that displays a two line message indicating what is about to happen, then pause the routine, allowing the operator to cancel or continue .

PROMPT

This command changes the appearance of the DOS system prompt. It sends Escape codes to ANSI.SYS.

SYNTAX

PROMPT prompt string

Using PROMPT without parameters will cause DOS to display its default system prompt, which is the letter of the currently logged drive followed by a greater-than symbol; for example, C>.

You may specify a custom prompt string, consisting of any character string you wish, and DOS will display the string as the system prompt.

Certain special effects characters may be added to the prompt string.

\$-	Moves to next line
\$\$	Dollar sign (\$)
\$b	Piping symbol ()
\$d	Current date
\$e	ESC character
\$g	Greater-than symbol (>)
\$h	Backspace
\$l	less-than symbol (<)
\$n	Current drive
\$p	Currently logged drive and directory
\$q	Equal sign (=)
\$t	Current time
\$v	DOS version number

If you have located the ANSI.SYS driver file in CONFIG.SYS, you may use the \$e character to send Escape sequences for keyboard and cursor control to ANSI.SYS.

Examples

PROMPT \$p\$g

Sets the system prompt to include the currently logged sub directory, followed by a greater-than symbol for example: C:\DOS>.

PROMPT please enter DOS command:\$_ \$p\$g

sets the system prompt to ask for command entry and places the current path on the next line.

When the ANSI.SYS. driver is loaded on a system with a color monitor.

PROMPT \$E [0;36,1;44m PROMPT \$E[2] PROMPT \$p\$g

sets the screen to bright cyan text on a blue background, clears the screen, and displays the currently logged sub directory in the DOS prompt.

RD OR RMDIR

This command removes empty sub directories.

SYNTAX

RD drive:\path\subdirectory

RMDIR drive:\path\subdirectory

RD requires that you supply the name of a completely empty sub directory that is a sub directory that does not contain any files. You cannot remove the currently logged sub directory. If the sub directory that you want to remove is located on a different drive or nested below other sub directories, you must include the full sub directory path to the unwanted directory on the command line.

Example

RD OLDDIR

removes an empty sub directory named OLDDIR located on a level just below the Current sub directory.

RD \OLDDIR

Removes an empty sub directory named OLDDIR located one level below the root directory on the currently logged drive.

`RDC:\WORD\OLDDIR`

removes an empty sub directory named OLDDIR one level below the WORD sub directory, which is just below the root directory on drive C.

Notes Directories that contain hidden or system files may appear empty, but cannot be removed until the hidden files are deleted or moved from the directory. To view hidden or system files, refer to the DIR command (/A;H or /A;S switch). To change the attributes of hidden or system files refer to the ATTRIB command. Some application software packages create hidden files. Some may have their attributes changed and may then be erased without problems; others are created as part of copy-protection schemes devised by software developers. Be very careful when manipulating hidden files. If you delete them, you may render your application software unusable.

REM

Indicates that the line is a non-executable string, used to place explanatory remarks within the batch file.

SYNTAX

REM string

The following syntax also works as a substitute for REM:

; string

The REM command allows you to include remarks in the file that explain what the file is doing.

Lines that begin with REM (or a semicolon) will display on the screen if ECHO is set ON; otherwise, they are ignored by DOS.

Example

Following listing shows a batch file that runs normally, but the included remarks are available to anyone who reads the file using a text editor or the TYPE command.

```
@ECHO OFF
rem** This batch file deletes BAK files, up what's left.
rem** Requires a path name on the command line,
rem** otherwise uses the root directory.
IF EXIST C:%1\*.BAK DEL C:%1\*.BAK
rem ** If a second parameter is included on the command line,
rem ** It must be a valid parameter used by the XCOPY command:
XCOPY C:%1\*. * A:/M/S%2
```

RENAME

This command changes file names.

SYNTAX

REN drive:\path\oldfile drive:\path\newfile

RENAME drive:\path\oldfile drive:\path\newfile

The REN command requires an old file name a new file name. When invoked, the command changes the old name to the new. Wildcard characters may be used to rename groups of files, but the wildcard specification must match between the old name and the new.

If the old file is not located in the current drive or sub directory, you may specify the drive and path name as part of the old file name parameter. It is not necessary to repeat the drive and path names with the new file name; DOS will keep the renamed file in its original location.

Examples

```
REN REPORT.TXT SALES.RPT
```

changes the name REPORT.TXT to SALES.RPT.

```
REN C:\WORD\*.BAK *.OLD
```

changes the names of all files with the extension .BAK on the C:\WORD sub directory so that they now have the extension .OLD.

SET

It creates environment variables and assigns values to them.

SYNTAX

If you invoke the SET command without parameters, DOS displays a list of current environment variables and their values.

To initialize a variable or assign a new value to a variable enter the name of a variable and an equal sign(=), followed by the desired value. The variable is stored in the operating system's *environment space*, an area of RAM set for this purpose. If the variable already exists in the environment, the value is changed to the indicated new value. If the variable does not already exist, it is created and assigned the value specified.

To remove a variable from the environment space, invoke SET with the variable name and equal sign, but do not indicate a value.

Example

```
SET COMSPEC = C:\DOS\COMMAND.COM
```

assigns the string C:\DOS\COMMAND.COM to an environment variable named COMSPEC. DOS uses this system variable to remember the location of the file COMMAND.COM.

SETVER

This command causes DOS to supply a different version number to an application.

SYNTAX

SETVER drive:\path application version /switches

The SETVER command updates a table of application that require DOS to provide an earlier version number. You must load this table into memory by including the command `DEVICE=SETVER.EXE` in your `CONFIG.SYS` file.

To display the current table of application invoke SETVER without the *application* or *version* parameters. To add an application to the table, invoke SETVER with the name of the application's executable file and the desired DOS version number. Thereafter, when you call that application DOS will supply the specified version number rather than the current version. This is useful for programs that require an earlier version of DOS but can run under DOS 6.

SWITCHES

- /D Deletes application names from the table.
- /DELETE Same as the /D option.
- /Q Suppresses on-screen messages when deleting applications from the table.
- /QUIET Same as the /Q option

Example

SETVER OLDGAME.EXE 3.3

Instructs DOS to tell the OLDGAME program that the DOS version number is 3.3.

SHIFT

Shifts the location of command line parameters one position to the left, thereby allowing you to include more than 9 parameters on a command line in a batch file that includes REM.

SYNTAX

SHIFT

The SHIFT command uses no parameters. Each time SHIFT is invoked, the parameters on the batch file command line are moved up one position.

Example

Listing given below shows a batch file that performs a complex loop that allows you to erase BAK files and make backups of any number of directories that you include on the command line, up to the limit of 127 characters on the command line.

```
@ECHO OFF
rem ** This batch file allows you to run the same two
rem ** commands on
rem ** any number of sub directory paths, by looping and
rem ** shifting.
rem ** Remember to include a backslash(\) in front of each
rem ** sub directory name on the batch file's command line.
rem ** STARTLOOP is the label for the top of the loop:
:STARTLOOP
rem ** Branch to ERROR label if current %1 parameter is
rem ** bad:
IF NOT EXIST C:%1\*. * GOTO ERROR
rem ** Otherwise, process:
ECHO Now processing %1 directory --
DEL C:%1\*.BAK > NUL
XCOPY C:%1\*. * A:/M/S
```

A batch file that demonstrates SHIFT

Notes You cannot shift in reverse. Each time you execute the SHIFT command, the %0 parameter is lost. If you want to save the %0 parameter, store it in a DOS environment variable before you execute SHIFT.

For example:

```
SET PARAM0=%0  
SHIFT
```

TIME

This command displays and allows changes to the system time.

SYNTAX

TIME hh:mm:ss.cc alp

If you invoke TIME without parameters, it displays the current system time and prompts you to enter a new time. If you do not want to change the current time, press Enter. Otherwise, enter the new time, where *hh* is the hour of the day in 24 hour format, *mm* is the minutes after the hour, *ss* is the seconds after the minutes, and *cc* is hundreds of a second. Only the hours parameter (followed by a colon) is required to set a new time, other time values are optional.

If you include the desired time on the command line, the system time is changed without prompting you.

Examples

TIME 10:

changes the system time to 10:00 a.m.

TIME 22:30

TIME 10:30p

either of the above example changes the time to 10:30 p.m.

TRUENAME

It displays the correct drive and sub directory path names of drives and sub directories that have been reassigned using the SUBST command.

SYNTAX

TRUENAME drive:\path

When invoked without parameters, TRUENAME displays the correct name of the Currently logged drive and sub directory. When invoked with the drive letter, TRUENAME reports the true name of the current sub directory of the specified drive. When invoked with a sub directory parameter, TRUENAME reports the correct name of the specified path.

Example

TURENAME E:

reports the drive and sub directory path assigned to drive E.

TYPE

It displays the contents of a file.

SYNTAX

TYPE drive:\path\file.

TYPE requires the name of a file. You may include a drive and directory name if the file is not the currently logged drive and sub directory. Wildcard characters are not allowed in the file name.

Examples

TYPE REPORT.TXT

Displays the contents of a file named REPORT.TXT on the screen.

TYPE REPORT.TXT | MORE

displays the contents of the file and pauses the display after each screenful of information.

TYPE REPORT.TXT > PRN

sends the contents of REPORT.TXT to the standard device.

- Notes*
- (a) The type command is intended to view ASCII text files.
 - (b) If the file display by TYPE is too large, it can scroll off the screen. For this reason, the output from TYPE is often redirected to a printer or piped through the MORE command.
-

|| VER

Displays the current DOS version number.

SYNTAX

VER

The VER command displays the current DOS version. VER has no additional parameters or option switches.

|| VERIFY

Enables / disables the verify switch for writing files during DOS operations.

SYNTAX

VERIFY on | off

If invoked without parameters, VERIFY displays the current state of the verify switch. Otherwise invoke VERIFY using either the *on* or *off* parameter.

When the verify switch is on, DOS compares the image of a file just written to a disk with the image of that file in the memory. DOS will display an error message if it is unable to write a verifiable copy of the file. When the verify switch is off, no such comparison is made. The default setting for the verify switch is off.

Example

VERIFY ON

turns on the verify switch.

- Notes*
- (a) Setting the verify switch on has the same effect on COPY commands as the /v option switch. Including this switch in COPY's command line overrides a verify of setting for the duration of the COPY command
 - (b) VERIFY has some limitations. The copy is compared to the image of the file in RAM not the original file on disk. Thus VERIFY will not discover any error that occurred while the original file was being read into RAM.
-

VOL

Displays the disk volume label.

SYNTAX

VOL DRIVE:

If invoked without parameters, VOL displays the currently logged drive volume label, if any. If you include the drive letter parameter, that drive's volume label is displayed.

Example

VOL A:

displays the volume label in drive A

Appendix H

DEVICE DRIVER COMMANDS

The device drivers of DOS 6 control memory allocation, display options, and disk drive usage. The drivers are all loaded into memory using the DEVICE command in the CONFIG.SYS file; except where otherwise noted. You may also load these drivers using the DEVICEHIGH command, provided that you have previously loaded HIMEM.SYS and EMM386.SYS.

ANSI.SYS

This command will extend screen and keyboard device driver.

SYNTAX

DEVICE=drive:\path\ANSI.SYS/switches

This driver loads extended capabilities for adapting the screen display and modifying the keyboard keys, to be used by applications that require these features.

Examples

DEVICE=C:\DOS\ANSI.SYS/X

loads the full set of ANSI keyboard and screen redefinition functions.

The following examples show ANSI escape sequences that can be entered by means of batch files once you have loaded the ANSI.SYS driver. When you key in these examples, do not treat the letters ESC literally. They stand for the ASCII "Escape" character (Decimal 27, or hexadecimal 1B), which on some displays will look like a small arrow pointing to the left or a caret followed by a left bracket (^[]). Be certain that your text editor can produce this character, and use it in place of the letters EXC.

ANSI Key Codes—Miscellaneous Keys

	K	Shift-K	Ctrl-K	Alt-K
spacebar	32			
-	45	95 (_)	31	0;130
=	61	43 (+)		0;131
[	91	123 (!)	27	0;26
]	93	125 (!)	29	0;27
\	92	124 ()	28	0;43
;	59	58 (:)		0;39
' (apostrophe)	39	34 (")		0;40
. (period)	46	62 (>)		0;52
, (comma)	44	60 (<)		0;51
/	47	63 (?)		0;53
' (rev. apostrophe)	96	126 (~)		0;41*
↑	0;72	56	0;141*	
↓	0;80	50	0;145*	
←	0;75	52	0;115	
→	0;77	54	0;116	
Del	0;83	46	0;147*	
End	0;79	49	0;117	
Enter	13		10	
Home	0;71	55	0;119	
Ins	0;82	48	0;146*	
PgDn	0;81	51	0;118	
PgUp	0;73	57	0;132	
Pause			0;0	
PrtScr			0;114	
Tab	9	0;15	0;148	0;165*
Null	0;03			

Note: The first column lists various keys; the second column (K) shows the code that corresponds to each key; the third column (*Shift-K*) shows the code that corresponds to each key combined with the Shift key; the fourth column (*Ctrl-K*) shows the code that corresponds to each key combined with the Ctrl key; and the fifth column (*Alt-K*) shows the code that corresponds to each key combined with the Alt key. Codes marked with an asterisk (*) are not available on some keyboards. To use these codes, install ANSI.SYS using the /X switch.

ECHO ESC[34;46m

sets screen colors to blue letters on a cyan background.

ECHO ESC[2J

clears screen after setting new colors.

ECHO ESC[0;67,"COPY*.* A:"p

ECHO ESC[0;68,"COPY*.* B:"p

redefines the F9 function key to invoke the command COPY *.* A: and the F10 function key to invoke the command COPY *.* B:.

ANSI Key Codes—Extended Keyboard Keys

Keypad Keys	K	Shift-K	Ctrl-K	Alt-K
/	47	47	0;142	0;4
*	42	0;144	78	
-	45	45	0;149	0;164
+	43	43	0;150	0;55
5	0;76	53	0;143	
Extended (Gray) Keys	K	Shift-K	Ctrl-K	Alt-K
↑	224;72	224;72	224;141	224;152
↓	224;80	224;80	224;145	224;154
←	224;75	224;75	224;115	224;155
→	224;77	224;77	224;116	224;157
Delete	224;83	224;83	224;147	224;163
End	224;79	224;79	224;117	224;159
Home	224;71	224;71	224;119	224;151
Insert	224;82	224;82	224;146	224;162
Page Down	224;81	224;81	224;118	224;161
Page Up	224;73	224;73	224;132	224;153

Note: These codes are not available on some keyboards. To use these codes, install ANSI.SYS using the /X switch. The first column lists various keys; the second column (K) shows the code that corresponds to each key; the third column (Shift-K) shows the code that corresponds to each key combined with the Ctrl key; and the fifth column (Alt-K) shows the code that corresponds to each key combined with the Alt key.

DISPLAY.SYS

This command loads international font sets for the screen display.

SYNTAX

DEVICE=drive:\path\DISPLAY.SYS
CON=(type,codepage,additional,subfont)

To specify an international character set using the DISPLAY.SYS driver, indicate a display type as well as at least one character set code page. The *type* parameter is one of the following;

EGA Enhanced graphics adapter, also VGA display
LCD PC convertible adapter

The codepage parameter is a three-digit number representing international character sets. Valid numbers are:

437	United States
850	Multilingual (Latin I)
852	Slavic (Latin II)
860	Portuguese
863	Canadian-French
865	Nordic

The additional parameter is a number indicating how many extra code pages you intend to prepare using the MODE command. Valid numbers are in the range 1–6. Refer to the MODE command entry for preparing code pages. Your system must be capable of handling multiple international character sets.

The subfont parameter is a number indicating how many subfonts your system supports for each code page. Default is 2 if type is EGA, 1 if type is LCD.

Example

```
DEVICE=C:\DOS\DISPLAY.SYS CON=(EGA,863,1)
```

loads the Canadian screen display font set and specifies that one additional font

set will be prepared using the MODE command.

Notes As an alternative to this driver, the COUNTRY.SYS and KEYBOARD.SYS files are also used to specify code page switching. COUNTRY.SYS is specified as a parameter to the NLSFUNC command; KEYBOARD.SYS is a parameter of the KEYB command that specifies several international keyboard layouts. Code page switching is not supported for monochrome or CGA devices. You can specify CGA or MONO for the type parameter, but they have no effect.

DRIVER.SYS

It assigns logical drive letters to floppy disk drives.

SYNTAX

DEVICE=drive:\path\DRIVER.SYS/switches

Each time this command is invoked, DOS assigns the next available floppy disk drive letter to the specified device. The switches allow you to specify exact formatting requirements for the new logical drive. You can assign additional drive letters to the same or other devices by repeating this command in CONFIG.SYS.

SWITCHES

- /D:n Indicates the drive number, where *n* is a number from 0 to 127; 0 refers to the A drive, 1 to the B drive, and so forth. Additional floppy disk drives must be external. On a system with one internal floppy disk drive, 0 refers to both drive A and B. This switch is required and should be supplied first.
- /C Enables change-line support, a feature that allows DOS to detect if a floppy disk has been changed in the drive during operations. Default is no change-line support.
- /F:n Specifies the drive format, where *n* is a number indicating one

of the following formats:

0 = 160K/180K or 320K/360K 5.25"

1 = 1.2 megabyte 5.25"

2 = 720K 3.5"

7 = 1.44 Mb 3.5"

9 = 2.88 Mb 3.5"

The default value is 2.

/H:nn Indicates the number of heads per drive, where nn is a number from 1 to 99

/S:nn Indicates the number of sectors per track, where nn is a number from 1 to 99. Defaults depend on the specified drive type, as follows:

/S:9 = 360K and lower, 720L 3.5"

/S:15 = 1.2Mb 5.25"

/S:18 = 1.44Mb 3.5"

?S:36 = 2.88Mb 3.5"

/T:nn Indicates the number of tracks on each side, where nn is a number from 1 to 999. Default is 80, except for disks that are 360K and lower, in which case the default is 40.

Example

```
DEVICE=C:\DOS\DRIVER.SYS /D:1 /T:80 /S:9 /H:2 /F:2
```

This assigns the next available drive letter to drive B, and indicates that it is to be treated as a 3.5", 720K drive. Assuming that you have a system with two floppy drives and a single hard disk, this command would allow drive B to function as both drive B and drive D. Thus, you could copy disks in the same drive by entering the command `COPY B:.* D:`, and DOS would prompt you to switch disks as required to make the copy.

Notes: DRIVER.SYS is intended for use by systems with external disk drive adapters and for systems that cannot normally copy files from disk to disk on the same floppy-disk drive. You cannot use Driver.SYS with hard disk drives. The SUBST command also assigns new logical drive letters to existing drives and is usually easier to implement and understand. If you are setting up RAM disks, place the RAM disk commands after the

DRIVER.SYS commands. If you use the /F switch, you can omit the /H, /S, and /T switches if default values are correct for the drive. If you specify the /H, /S, and /T switches, you can omit the /F switch.

DBLSPACE.SYS

It specifies the memory location of the compressed-data operating system driver named DBLSPACE.BIN.

SYNTAX

DEVICEHIGH=drive:\path\DBLSPACE.SYS/switch

DOS automatically loads DBLSPACE.BIN, along with the operating system at start-up. Since it is loaded before other drivers that manage upper memory, it is initially loaded in conventional memory. Use the DEVICEHIGH command in CONFIG.SYS, along with the /MOVE switch to move the compressed-data driver to upper memory.

SWITCH

/MOVE Moves DBLSPACE.BIN from the top of conventional memory (its default location) to the bottom when used with the DEVICE command. Move DBLSPACE.BIN to the bottom of conventional memory to avoid conflicts with programs that require the top of conventional memory. This switch moves DBLSPACE.BIN to upper memory when used with the DEVICEHIGH command.

Example

DEVICEHIGH=C:\DOS\DBLSPACE.SYS /MOVE

Moves DBLSPACE.BIN to upper memory. EMM386.EXE must be previously loaded for this command to work.

Note Do not confuse these two similar named driver files. Load DBLSPACE.SYS in the CONFIG.SYS file. This driver file only moves DBLSPACE.BIN. This file is not loaded from CONFIG.SYS. The DOS loads it automatically.

EGA.SYS

Driver which saves and restores EGA screens used with the DOS Shell Task Swapper.

SYNTAX

DEVICE=drive:/path/EGA.SYS

This driver loads saving and restoring capabilities for EGA screens. Use this driver if your system has trouble handling screen displays when moving between programs in the DOS Shell. There are no switches and its functions are transparent to the user.

Example

DEVICE=C:\DOS\EGA.SYS

loads the EGA screen saver functions when the EGA.SYS file is stored on the C:\DOS subdirectory.

EMM386.EXE

It installs expanded and reserved memory support for IBM PC/AT type 80386 and 80486 computer systems with extended memory.

SYNTAX

DEVICE=drive:\path\EMM386.EXE size ON/OFF/AUTO RAM/NOEMS

/switches

The EMM386.EXE expanded-memory manager should be installed only after HIMEM.SYS (extended-memory manager) is installed. Do not load this driver using the DEVICEHIGH command. The DEVICEHIGH command is valid only after this driver is completely loaded.

SWITCHES

<i>size</i>	Required only if you intend to configure a portion of your system's total extended memory as expanded memory, where <i>size</i> is a number indicating the expanded memory size in kilobytes (e.g., 64 equals 64K). If you leave out this parameter and the NOEMS parameter, up to 32768K (or the amount available on your system, whichever is less) of extended memory will be used as expanded memory. If you specify NOEMS, default size is 0.
<i>A=nn</i>	Specifies the number of alternate register sets to use for multitasking, where <i>nnn</i> is the number of sets. The valid range is from 0 through 254. Default is 7.
AUTO	Loads the Expanded Memory driver, but activates the driver only when a program calls for expanded memory.
<i>B=nnnn</i>	Specifies the lowest address in RAM to be used as a bank for swapping portions of RAM to and from expanded memory. Valid addresses are from 1000 through 4000 hex. Default is 4000 hex.
<i>D=nnn</i>	Specifies the amount of memory to reserve for buffered direct-memory access, where <i>nnn</i> is the amount of memory in kilobytes. The valid range is 16-256. Default is 16.
FRAME= <i>nnnn</i>	Specifies the address in memory for the expanded-memory page-frame segment base, where <i>nnnn</i> is a number that specifies the base addresses in hexadecimal. Valid addresses are from 8000 through 9000 hex, and C000 through E000 hex, in increments of 400 hex. You can disable the page frame by specifying FRAME=NONE, although this is not recommended as it may cause some expanded-memory programs to work incorrectly.

H= <i>nnn</i>	Specifies the number of segment handles to be used, where <i>nnn</i> is the number of handles. The valid range is 2-255 handles. Default is 64.
I= <i>nnnn-nnnn</i>	Specifies a range of memory address to be used as page-frame addresses. Valid addresses are form A000 through FFFF hex, and are rounded down to the nearest 4K.
L= <i>nnnn</i>	Prevents a portion of extended memory from being used as expanded memory, when <i>nnnn</i> is the amount of extended memory to exclude.
MIN= <i>minsize</i>	Specifies a minimum amount of expanded memory to be provided by EMM386.EXE, if available, where <i>minsize</i> is the amount to provide, in kilobytes. Valid range is 0 through the amount specified by the size parameter. Default is 256, unless you specify the NOEMS parameter, in which case the default is zero.
NOEMS	Disables all expanded-memory support if you have included the RAM parameter and want reserved-memory support only.
NOHI	Prevents the upper-memory portion of EMM386.EXE from loading into upper memory. This switch increases memory available for UMBs while decreasing conventional memory.
NOVCPI	Disables VCPI application support. If you use this switch, you must also use the NOEMS switch. This switch reduces the amount of extended memory used by EMM386.EXE.
OFF	Loads but does not activate the Expanded Memory driver.
ON	Activates the Expanded Memory driver immediately upon loading. This is the default setting.
/P <i>nnnn</i>	Specifies the hexadecimal memory address for the page frame, where <i>nnnn</i> is a number that specifies the address. Valid addresses are from 8000 through 9000 hex, and C000 through E000 hex, in increments of 400 hex.
P <i>n</i> = <i>nnnn</i>	Specifies the page address, where <i>n</i> is the page number (0-255) and <i>nnnn</i> is the address in memory. Valid addresses are from 8000 through 9C00 hex, and C000 through EC00 hex, in increments of 400 hex. Pages 0 through 3 must be contiguous. If you use the M, FRAME,

or /P switch, you cannot specify addresses for pages 0 through 3.

RAM=*start-end*

Enables support for *reserved memory*, that area of RAM between 640K and 1024K, where *start-end* is a range of addresses (in hex) within this area. If you leave out the range of addresses, DOS looks for all the unused reserved memory it can find.

When support for this memory is enabled, DOS will find and utilize unused portions of this area for loading other device drivers with the DEVICEHIGH (CONFIG.SYS) and LOADHIGH (command prompt) commands.

ROM=*start-end*

Reserves a range of memory addresses for shadow RAM, where *start* and *end* indicate memory addresses between A000 and FFFF hex. Address parameters are rounded down to the nearest 4K. Use this switch on systems that are not already equipped with Shadow RAM.

/V

Displays status and error messages during loading.

W=ON/OFF

Enables support for the Weitek math coprocessor if set to ON. Default if OFF.

WIN=*start-end*

Reserves a range of segment addresses for Windows, where *start* and *end* are valid range of memory addresses. You may specify a range between A000 and FFF hex. Ranges are rounded down to the nearest 4K. This switch takes precedence over the RAM, ROM, and I switches if the range specified here overlaps their ranges.

X=*nnnnn-nnnn*

Excludes a range of RAM addresses for use as page-frame addresses. Valid addresses are from A000 through FFFF hex and are rounded down to the nearest 4K. This switch takes precedence over the I = switch if the two ranges overlap.

Examples

```
DEVICE=C:\DOS\EMM386.EXE 1024 RAM
```

enables expanded-memory support for 1Mb of expanded memory, plus reserved-memory support.

DEVICE=C:\DOS\EMM386.EXE RAM NOEMS

enables support for reserved memory only.

Notes EMM386.EXE can be used only on IBM PC/AT computers with an 80386 or higher processor. The /Pnnnn and /V switches are the only switches that require the forward slash character. Do not use EMM386.EXE switches very often. Normal defaults are established when switches are not used; use the default values whenever possible. EMM386.EXE can cause your computer to behave unpredictably if switches are used improperly. If you are using Windows 3.1+, the I, X, NOEMS, Mn, /Pnnnn, and FRAME switches will override any settings for EMMINCLUDE, EMMEXCLUDE, and EMMPAGEFRAME settings in your SYSTEM.INI file.

HIMEM.SYS

Loads extended memory support using Microsoft's XMS extended memory specification.

SYNTAX

DEVICE=drive:\path\HIMEM.SYS/switches

Use HIMEM.SYS to enable extended memory support for all DOS commands that make use of RAM above 1024K. Such CONFIG.SYS commands include EMM386.EXE, DOS=HIGH, as well as any device drive that is loaded into extended memory.

SWITCHES

/A20CONTROL:
ON/OFF

Forces HIMEM.SYS to assume control of the A20 interrupt handler (that portion of memory used to access extended memory) at the time it is loaded, when set to ON. When set to OFF, HIMEM.SYS will assume control

	of the A20 interrupt handler used when HIMEM.sys is loaded.
/CPUCLOCK: [ON/OFF]	When set to ON, slows down HIMEM.SYS on systems where the clock speed changes when HIMEM.SYS is loaded. Default is OFF.
/EISA	Forces HIMEM.SYS to allocate all available extended memory on EISA systems with more than 16K RAM. Not required on other systems.
/HMAMIN= <i>nn</i>	Specifies the amount of memory an application must use before having access to extended memory, where <i>nn</i> is the amount of memory in kilobytes. The valid range is 0–63K. Default is 0, meaning the HIMEM.SYS will allocate extended memory to the first application that requires it. This switch has no effect when running Windows in enhanced mode.
/INT15= <i>nnnn</i>	Specifies the amount of extended memory HIMEM.SYS will ignore for XMS support, where <i>nnnn</i> is a number representing the amount of memory in kilobytes. This switch allows HIMEM.SYS to reserve a portion of extended memory for use by programs that require extended memory but are not compatible with the XMS memory specification HIMEM.SYS uses. Default is zero. If you have applications that are not compatible with XMS memory, set this switch to the required amount of non-XMS memory, plus 64K.
/MACHINE: <i>aaaa</i>	Specifies the type of CPU that you are using to access the A20 interrupt handler. <i>Aaaa</i> can be either a character based machine code or an equivalent number, as indicated in Table given below.
/NUMHANDLES = <i>nnn</i>	Specifies how many memory block handles can be used simultaneously, where <i>nnn</i> is the number of handles. The valid range is 1–218 handles. Default is 32. This switch has no effect when running Windows in enhanced mode.
/SHADOWRAM: ON/OFF	Disables shadow RAM on some computers that support this feature and adds the memory used by shadow RAM back to available memory when set to OFF. When set to ON, HIMEM.SYS ignores shadow RAM. Default

is OFF if your computer has less than 1Mb of extended memory.

/V Displays status and error messages during loading.

Equivalent Machine Code Numbers

Number	Machine Code	Description
1	AT	IBM PC/AT
2	PS2	IBM PS/2
3	PTLCASCADE	Phoenix Cascade BIOS
4	HPVECTRA	Hewlett-Packard Vectra A/A+
5	ATT63300PLUS	AT&T 6300+
6	ACER1100	Acer 1100
7	TOSHIBA	Toshiba 1600 and 1200XE
8	WYSE	Wyse 12.5Mhz 80286
9	TULIP	Tulip SX
10	ZENITH	Zenith ZBIOS
11	AT1	IBM PC/AT—Alternative Delay
12	CSS	CSS Labs (Also IBM PC/AT—Alternative Delay)
13	PHILIPS	Philips (Also IBM PC/AT—Alternative Delay)
14	FASTHP	Hewlett-Packard Vectra
15	IBM7552	IBM 7552 Industrial Computer
16	BULLMICRAL	Bull Micral 60
17	DELL	Dell XBIOS
18	KECARO	Keebler Elvin CARO

Examples

```
DEVICE=C:\DOS\HIMEM.SYS
```

enables XMS extended memory support for all available extended memory.

```
DEVICE=C:\DOS\HIMEM.SYS /INT15=2048
```

enables XMS extended memory support for all memory, reserving 2048K for other programs not compatible with XMS.

Notes Any DOS command that makes use of extended memory requires that HIMEM.SYS be loaded first. If you intend to use EMM386.SYS (or a compatible driver) to load support for expanded memory, you must load

HIMEM.SYS first. Do not load HIMEM.SYS with the DEVICEHIGH command, Use the DEVICE command instead.

INTERLNK.EXE

It directs instructions to drives or printer ports on the Interlink server.

SYNTAX

DEVICE=drive:\path\INTERLNK.EXE/switches

Install the INTERLNK.EXE device driver on networked systems in order to use the INTERLNK and INTERSVR line commands.

SWITCHES

/DRIVES:n

Specifies the number of redirected drives, where *n* is the number. Specify 0 to redirect printers only. Default is 3.

/NOPRINTER

Disables printer redirection.

/COMn/address

Specifies a serial port for data transfer, where *n* is the number of the port (1-4). Alternatively, use the address parameter to specify the address of the serial port if it is non-standard. If you omit both parameters, DOS uses the first port it finds connected to the server. If you omit this switch as well as the /LPT switch, DOS scans all ports.

/LPTn/address

Specifies a parallel port for data transfer, where *n* is the number of the port (1-3). Alternatively, use the address parameter to specify the address of the parallel port if it is non-standard. If you omit both parameters, DOS uses the first port it finds connected to the server. If you omit this switch as well as the /COM switch, DOS scans all ports.

/AUTO

Attempts to establish a connection with the server when the client starts up. If no connection is made,

INTERLNK.EXE is not installed. By default, DOS installs INTERLNK.EXE even when a connection is not made at startup time.

/NOSCAN

Disables attempts to establish a connection with the server when INTERLNK.EXE is installed. Default is to attempt to establish the connection.

/LOW

Forces DOS to load INTERLNK.EXE in conventional memory. By default, INTERLNK.EXE is loaded in upper memory if it is available.

/BAUD:rate

Forces maximum baud rate for serial data transfer. Valid rates are: 9600, 19200, 38400, 57600, and 115200. Default is 115200.

/V

Ignores timer conflicts. Use this switch with serial communications if data transfers freeze the client or server.

Example

```
DEVICE=C:\DOS\INTERLNK.EXE/COM1/NOPRINTER
```

loads the Interlink driver to use COM1 and specifies that printer ports are not being redirected.

Notes The location of the `DEVICE=INTERLNK.EXE` command in `CONFIG.SYS` affects drive assignments, especially RAM disks. To prevent drive assignment errors, place the command last in `CONFIG.SYS`. If you are using a serial mouse with Microsoft Windows, specify either the `/LPT` switch, or a `/COM` switch that designates a port other than the one used by the mouse. If you redirect LPT1 or LPT2 and print from Microsoft Windows, use Control Panel to assign the printer to either LPT1.DOS or LPT2.DOS. Commands directed to another computer must be compatible with the version of DOS the computer is running. The safest approach is to run all computers with the same version of DOS, if possible. The following commands do not work with the INTERLNK.EXE device driver: CHKDSK, DEFRAG, DISCOMP, DISKCOPY, FDISK, FORMAT, MIRROR, SYS, UNDELETE, and UNFORMAT.

POWER.EXE

Lowers the rate of power consumption when devices are idle.

SYNTAX

DEVICE=drive:\path\POWER.EXE ADV:level STD/ OFF/ switch

Use the DEVICE command to load this driver. The DEVICEHIGH command has no effect. By default, POWER.EXE attempts to load into upper memory.

Use the ADV: parameter to indicate your desired level of power conservation, where *level* is one of the following:

- MAX Conserves greatest amount of power.
- REG Balances power conservation with performance. This is the default.
- MIN Conserves least amount of power, allowing near-full performance.

The STD parameter forces POWER.EXE to use the hardware's power-management features, if these features support the Advanced Power Management (APM) specification. If your hardware does not support APM, this parameter turns POWER.EXE off.

Alternatively, you can use the OFF parameter to turn off power management at startup time.

SWITCH

/LOW Forces DOS to load POWER.EXE device driver in conventional memory.

Example

DEVICE=C:\DOS\POWER.EXE ADV:MAX STD

loads POWER.EXE, allows maximum power conservation, and uses the hardware's power management features to respond to POWER.EXE's instructions.

Note Load POWER.EXE if your portable or laptop hardware has no built-in

power conservation features or if you want to use the POWER command at the DOS prompt.

RAMDRIVE.SYS

Initializes a RAM disk.

SYNTAX

DEVICE=drive:\path\RAMDRIVE.SYS size sectors
directory/switch

A RAM disk simulates a disk drive in random access memory (RAM). RAM disks tend to be faster than physical drives, although the fastest hard disks can run almost as fast. RAM disks are also valuable when programs access the disk drive frequently, reducing drive wear as well as saving time.

RAM disks are volatile, however. You must save the data on a RAM disk to a physical drive before turning off the power to your computer. If you experience a power failure while running a RAM disk, all data that was not saved to a physical disk will be lost.

The size parameter indicates the storage area of the RAM disk, expressed in kilobytes. Default is 64, for 64K. The sectors parameter indicates the size of a disk sector, expressed in bytes. Default is 512 bytes. The directory parameter indicates the maximum number of directory entries, from 2 to 1024. Default is 64.

SWITCHES

The following switches place the RAM disk in either extended or expanded memory. Use one or the other, not both. If you do not include one of these switches, DOS will place the RAM disk in conventional memory. If you install the RAM disk in extended memory, be sure to invoke DEVICE = HIMEM.SYS first. If you install the disk in expanded memory, load a compatible expanded memory manager, such as EMM386.EXE, first.

/A Stores the RAM disk in expanded memory.

/E Stores the RAM disk in extended memory.

Example

```
DEVICE=C:\DOS\RAMDRIVE.SYS 2048 512 1024 /E
```

installs a RAM disk in extended memory. Disk size is 2Mb (2048K); sector size is 512 bytes; maximum number of directory entries is 1024.

Notes You can set up more than one RAM drive if you like, provided your system has sufficient memory to hold them. To set up additional RAM drives, repeat the `DEVICE = RAM DRIVE.SYS` command in `CONFIG.SYS` for each drive. Many applications now make use of a `TEMP` environment variable, which references a disk directory. For maximum efficiency, set this variable to a directory on a RAM drive. If you are using Windows, use a RAM drive at least 2Mb in size to allow room for Windows' temporary files.

SETVER.EXE

It install a list of software applications that require DOS to supply an earlier version number.

SYNTAX

```
DEVICE=drive:\path\SETVER.EXE
```

The command to load the `SETVER.EXE` driver is automatically added to your `CONFIG.SYS` file when you install DOS 6. This command causes DOS to load a list of applications that require earlier version numbers.

You can delete this command from your `CONFIG.SYS` file if you are sure that none of your applications require an earlier version number.

Notes `SETVER.EXE` uses no optional parameters or switches. In the `CONFIG.SYS` file, place the command `DEVICE=SETVER.EXE` before any `DEVICE` commands that load drivers requiring earlier version numbers.

SETVER.EXE only allows applications that require earlier DOS version numbers to receive their expected version number. Applications must be in all other ways compatible with DOS 6 to function correctly.

WHAT DOS 6 OFFERS FOR WINDOWS USERS

INTRODUCTION

DOS 6 added Windows version of the standard DOS utilities, giving Windows users not to access the DOS Shell for disk maintenance chores. DOS 6 contains Windows versions of SMARTDrive, Backup, Anti-Virus, and Undelete. DOS 6 puts icons for these programs in a new Microsoft Tools Program Group, available in the Program Manager.

A new Tools pull-down menu in the File Manager also allows access to the above said utilities, as does the button bar in the Windows for Workgroups File Manager.

Microsoft DOS 6 saves you disk space not only through compression, but by planning ahead. The DOS 6 Setup program asks whether you want the Windows versions, the DOS versions, or both versions of Backup, Undelete, and Anti-Virus. By choosing just the Windows versions, thus leaving out the redundant DOS versions, you can save some disk space.

If you're running Windows, consider buying a tape backup system. The DOS 6 Backup application for Windows requires that you place floppy disks in your computer to backup your data. Because most hard drives that contain Windows are fairly large, this process can require dozens of disks and several hours. Tape backup units record your hard drive's data onto cassette tapes; some even work in the background.

INSTALLING DOS 6 IF WINDOWS IS ALREADY INSTALLED

DOS 6 is very much aware of Windows. During the installation process, DOS 6 searches your hard drive for an existing copy of Windows. If it finds one, it places icon for the DOS 6 Windows utilities like Backup, Undelete, and Anti-Virus directly into the Program Manager. You'll see the new Microsoft Tools Program Group waiting for you the next time you load Windows.

DOS 6 also adds a Tools menu item to the File Manager. DOS 6 updates your AUTOEXEC.BAT and CONFIG.SYS files so they refer to the more current versions of HIMEM.SYS and SMARTDrive. In fact, to avoid any conflicts, you should delete the versions from your Windows 3.1 directory.

INSTALLING WINDOWS 3.1 IF DOS 6 IS ALREADY INSTALLED

DOS 6 contains the most recent copies of two important utilities, SMARTDrive and HIMEM.SYS, but Windows 3.1 doesn't know that. So, if you're installing Windows 3.1 over DOS 6, Windows tries to change your AUTOEXEC.BAT and CONFIG.SYS files so that they refer to the Windows 3.1 versions of SMARTDrive and HIMEM.SYS. (Those older versions are in the Windows 3.1 directory.)

Check your AUTOEXEC.BAT and CONFIG.SYS files after installing Windows; make sure they refer to the SMARTDrive and HIMEM.SYS files in your DOS 6 directory, not your Windows directory.

SWAP FILES

While Windows works, it copies information from your computer's memory to the hard drive. Windows then uses this virtual memory as RAM to run more programs at once.

To create this virtual memory, Windows creates one of two kinds of swap files—permanent or temporary. A permanent swap file is a portion of your hard drive set aside for Windows' exclusive use. It consists of a hidden file on your hard drive. Windows works faster with a permanent swap file, but there's a catch: the permanent swap file stays around, consuming part of your hard disk space, even when Windows isn't running.

The alternative is a temporary swap file—a file Windows creates when Windows starts, and deletes when you exit Windows. The trade-off is that Windows runs more slowly with a temporary swap file. If you have enough hard disk space, consider letting Windows create a permanent swap file on your hard disk. Unfortunately, neither Stacker nor DOS 6 DoubleSpace can compress this portion of your hard disk.

You can only create a permanent swap file out of your uncompressed hard disk space. If you try to create a permanent swap file on a compressed hard disk, Windows sends you an error message. Try not to use DoubleSpace until after you install Windows. That way, Windows can create its permanent swap file on an uncompressed portion of your hard disk. When DoubleSpace goes to work, it will leave your Windows permanent swap file uncompressed, and compress the rest of your hard disk instead.

MANAGING MEMORY WITH MEMMAKER

The key to making DOS programs run smoothly under Windows is to manage your memory appropriately. In the past, Windows owners were forced to make meticulous changes to their system files, trying to find the right combination of memory settings for the best performance. DOS 6 automates much of this task with MemMaker.

The DOS 6 program, MemMaker, automatically tries out various memory configurations and then chooses the one that works best for your particular setup. Sometimes MemMaker simply changes the order of the commands in your AUTOEXEC.BAT and CONFIG.SYSs files. Other times, it changes their settings by changing their parameters-adding special commands before or after the commands to subtly change their performance.

Don't bother trying to run MemMaker under Windows; DOS 6 won't let you. Windows' presence in the background would only confuse the MemMaker program while it tried to sort out the best possible memory configuration.

MemMaker can work its magic with Windows in mind. Even if you choose MemMaker's Express Setup option, MemMaker automatically optimizes your computer's upper memory to work best with Windows. In fact, if you don't plan to run Windows, choose with MemMaker's Advanced Options; from there, answer No to the optimize upper memory for use with windows question. That conserves your computer's upper memory for use by other programs.

If necessary, MemMaker changes Windows' SYSTEM.INI file to reflect any needed changes in memory settings. If you use Windows and Windows programs exclusively, you might not need MemMaker. MemMaker maximizes conventional memory for DOS programs by moving programs out of conventional memory and into extended memory, which is the type of memory Windows uses. If you plan to access the DOS Shell, while in Windows (or run DOS programs by themselves), feel free to use MemMaker. If you don't use any DOS programs at all, don't bother with MemMaker. Running it will just hinder Windows' performance.

OPTIMIZING CONFIG.SYS FOR WINDOWS

The CONFIG.SYS file strongly affects your computer's performance. Here's a look at the CONFIG.SYSs file as it pertains to Windows.

Device Drives

Every device of your computer's hardware—the mouse, fax cards, sound cards, and others—is considered a device by your computer. To customize how that device works, DOS looks for a device driver in your CONFIG.SYS file. Drivers are small programs that let your computer communicate with that device. Here's how some of your drivers affect Windows.

HIMEM.SYS

DOS 6 installs this driver on any computer with an 80286 or higher processor and extended memory. The HIMEM.SYS driver manages your computer's extended memory, dishing it out to programs that need it.

HIMEM.SYS has some special command-line settings, but the default settings work well with Windows on most computers. The line containing HIMEM.SYS must appear first in your CONFIG.SYS file, before any other device drivers. Most people make HIMEM.SYS third or second line. If you install Windows 3.1 over DOS 6, Windows tries to change that line so it refers to the HIMEM.SYS in the Windows directory. Don't let it do that. Make sure you're using the HIMEM.SYS file with the most current date, which is probably the one in your DOS 6 directory.

RAMDRIV.SYS

This device driver takes some of your RAM and converts it into a virtual hard drive. It works just like a regular hard drive, but much faster. It's also much more volatile: it will disappear if your computer loses power.

If you have more than 8 megabytes of RAM, consider turning some of it into a RAM drive. By using this RAM drive as your TEMP file storage area you can set up Windows' Print Spooler, as well as other operations. Be sure to set up your RAM drive to contain at least 2 megabytes, however, or else you might run out of room, especially when working with large files in Word for Windows.

Unless you do a lot of printing, you might be better off leaving out the RAMDRIV.SYS setting and simply handing your extended memory over to Windows for running programs. The less extended memory Windows has at its disposal, the less efficiently it runs your programs.

MemMaker will replace many of your DEVICE = statements with the word DEVICEHIGH =. This addition will load your device driver into upper memory, freeing additional conventional memory for running DOS applications under Windows.

Finally, it bears repeating that a RAM drive may look and act like a hard drive, but it exists only in your computer's memory. When your computer is turned off (either by the on/ off switch or through an accidental power failure), all information in the RAM drive is erased. Don't confuse a RAM drive with a Windows swap file; they're the opposite of each other. A RAM drive creates a virtual hard drive out of memory, making for a very speedy hard drive. A swap file creates virtual memory from your hard drive. This virtual memory works much slower than real memory, but sometimes Windows needs memory space more than it needs hard disk space.

EMM 386.EXE

This program, when loaded as a device in your CONFIG.SYS file, can convert some of your computer's extended memory into expanded memory for programs that need that type of memory. It also lets you load programs and device drivers into upper memory blocks (UMBs).

MemMaker automatically puts the EMM386.EXE driver into your CONFIG.SYS file. Also, as part of its optimization technique, MemMaker grabs extra portion of memory for exclusive use by Windows. For instance, look at the following line from a CONFIG.SYS file:

```
DEVICE= C : \DOS \EMM386.EXE RAM WIN =DFFF WIN = DA00-DCFF
```

Here, the memory ranges listed after the WIN = sections are extra memory that MemMaker has activated for use by Windows.

Most of the extended memory settings specified by EMM386 in the CONFIG.SYS file take precedence over the memory settings in Windows SYSTEM.INI file. If the two files have conflicting instructions, Windows uses the ones in the CONFIG.SYS. That means that if you change those settings in the SYSTEM.INI file, they have no effect when EMM386.EXE is loaded.

Other Config.Sys Settings

These next few CONFIG.SYS settings aren't device drivers, but they can affect Windows performance just as much.

Files

This line sets the number of files DOS allows a program to open at one time. Because Windows usually deals with a lot of programs and files at the same time, make sure the line FILES = 30 appears in your CONFIG.SYS file. The default is 8;

if you have problems under Windows, try increasing the number to 40, 50, or more. Don't get carried away, however. Large numbers in the FILES setting translate to less memory available to other applications. Choose the setting you need -and no higher.

Buffers

You Probably won't need to worry about the BUFFERS command when running Windows. It's an older form of disk cache that essentially has been replaced on 386 class machines by SMARTDrive. Some communications programs bring an exception to this rule.

Stacks

Each time a piece of your computer's hardware-a mouse for instance-needs some processing time from your computer's CPU, it generates something called an interrupt. If Windows is busy when the interrupt signal comes in, the interrupts "stack up". Sometimes this can cause problems-your mouse might hang the system. Therefore, when Windows installs itself, it adds the line STACKS=9, 256 to your CONFIG.SYS file. This allows for nine stacks of 256 bytes of conventional memory. This default setting should work adequately for running Windows. If you see an Internal Stack Overflow message when running Windows in 386-Enhanced mode, try slowly increasing the number 256; if that doesn't work, try slowly increasing the number 9.

OPTIMIZING AUTOEXEC.BAT FOR WINDOWS

Your AUTOEXEC.BAT file contains commands you would like your computer to perform every time you turn it on. You can load frequently accessed utilities, for instance, or you can add the single line WIN to the bottom of the AUTOEXEC.BAT file to load Windows automatically.

Here's a look at how certain settings in your AUTOEXEC.Bat file can affect Windows performance under DOS 6.

Smartdrv.Exe

SMARTDrive works as a disk-caching program. Computers can read information from RAM more quickly than from a hard disk. Therefore, when Windows reads information from the hard drive, the information also heads for a special area in your computer's memory known as a cache. Then, if Windows needs the information again, it reads it from the cache, which is faster than re-accessing it from the

slower hard drive.

DOS 6 automatically installs SMARTDrive in your AUTOEXEC.BAT file. If you're running Windows in 386-Enhanced mode (or if you're running EMM386.EXE), DOS 6 installs SMARTDrive's "double-buffering" feature by putting SMARTDrive in your CONFIG.SYS file, as well. The double-buffer provides compatibility for hard-disk controllers that have trouble working with Windows in 386-Enhanced mode.

You may not need the double-buffering feature however. Here's how to check. Use MemMaker, and then run Windows for a few days with the double-buffering feature in place. (DOS 6 normally adds double-buffering if you're running Windows). At the command prompt, type SMARTDRV and press Enter. Look at the column labeled Buffering. If you see the word yes anywhere in that column, you need double-buffering-leave that line in your CONFIG.SYS file. If every line says no, you can safely remove the SMARTDrive line from your CONFIG.SYS file.

Set

The SET command places something called a variable into your DOS environment. A variable is a special portion of memory set aside to hold temporary information. For example, programs can look at these variables to find special settings. Windows introduces a variable called TEMP by placing this line in your AUTOEXEC.BAT file.

```
SET TEMP =C : \DOS
```

This assumes that your DOS files are stored on your C drive, as they are on most computers. Now, when Windows creates temporary files-to store files while printing, for instance-it checks the TEMP variable to see in what directory they should be stored. In this case, Windows would store them in your DOS directory.

To see what environment settings are currently active, type SET at any DOS prompt. The default setting of TEMP =C: \DOS lets Windows pour all this temporary, "garbage" files directly into your DOS directory. These TEMP files will then mingle with your DOS programs. To keep your TEMP files separate from your DOS files, create a TEMP subdirectory from your DOS directory; then change the TEMP variable to TEMP=C: \DOS \TEMP. When you're not using Windows, you can look in your DOS \TEMP directory to see if Windows forgot to delete some of its temporary files. If there are any left, feel free to delete them. Make sure you are out of Windows first, however, and not just shelled to DOS.

Path

The PATH setting is the other AUTOEXEC.BAT file setting altered during the Windows installation. Directories are listed after the PATH command prompt. Windows, therefore, places its WINDOWS directory in your PATH setting. That way, you can type WIN to start Windows, even if you aren't currently in the Windows directory-DOS finds the WIN.COM program in the Windows subdirectory and loads it.

Share

Windows doesn't automatically place the DOS program SHARE in your AUTOEXEC.BAT file, but you should. Normally used on networks, SHARE prevents you from opening a file that's currently being used by another program. Because Windows runs many programs at once, it's easy to accidentally open the same file in a different window. Then, when you save both versions, one will overwrite the work you've done with the other.

To prevent this, add the following line to your AUTOEXEC.BAT file :

```
INSTALL=C:\DOS\SHARE.EXE.
```

Then, should you mistakenly start to open a file for a second time, Windows will flash an error message telling you that the file is already open.

Mouse Command Line

Most mouse installation programs place a mouse driver in either your AUTOEXEC.BAT or CONFIG.SYS file. However, because Windows contains its own mouse driver, the extra mouse driver merely consumes valuable memory space. If you plan to use Windows exclusively, feel free to remove any other mouse driver you might find in your AUTOEXEC.BAT or CONFIG.SYS file. Beware, however-if you use shell to DOS, you won't find mouse support for those DOS programs under Windows. Only remove the mouse driver if you never use DOS programs.

Watch Out for These DOS Commands and Programs

Several DOS commands aren't intended to be run at the same time Windows is running. If you try to run them from within Windows, you'll probably receive a DOS error message before any harm is done. Still, avoid taking any chances by avoiding the following DOS commands and programs.

Append, Assign, Join, and Subst

These commands play tricks on the way DOS recognizes drives and directories. These commands can work well for DOS applications, but not when running under Windows. Avoid them. If you want to create or delete virtual drives with SUBST, you can exit Windows, safely use the command, and then load Windows again.

Chkdsk /F

CHKDSK can discover and fix errors in the way files are stored on your hard drive. However, if it tries to fix an error while running under Windows, you may lose some data. The /F option on the command line tells CHKDSK to fix the errors, so avoid that option under Windows. Exit Windows (don't just shell to DOS) before using the CHKDSK command.

Dblspace

DOS 6 won't let you run the DoubleSpace program under Windows. It needs to be run from a DOS session instead. Also, when running the DoubleSpace program, be sure to leave enough uncompressed space available to accommodate Windows' permanent storage file. Depending on the size of your hard disk, your amount of RAM, and the size of your Windows to use as a permanent swap file. You create Windows' permanent storage file under the 386-Enhanced setting in the Control Panel. The storage file lets Windows run faster. Windows treats the file as virtual memory, using it to swap information back and forth as you open and close programs.

Defrag

The DEFRAG program reorganizes your hard disk by moving pieces of files closer to each other to speed up access them. This reorganization will confuse Windows, however. Don't try to run DEFRAG from either Windows or the Shell.

Vsave

The DOS virus checker, VSAFE, needs to be disabled before you begin installing Windows; otherwise, it will mistake some of Windows' installation commands for damaging viruses. VSAFE is a memory-resident program that's loaded from your AUTOEXEC.BAT file. To disable it, either remove it completely from the AUTOEXEC.BAT file or add the letters REM to the beginning of the line, like

this:

```
REM VSAFE.EXE
```

Save your AUTOEXEC.BAT file and then reboot your computer. With the REM, VSAFE won't be loaded, and you can safely install Windows, exit the program, remove the REM portion, and reboot your computer to restore VSAFE.

DOS Shell

The DOS Shell adds a point-and-click interface to your DOS programs and commands. You can start programs from the Shell and return to the Shell when the program's finished, but don't start Windows from the Shell. Windows needs to start all by itself at the command line so it can properly organize your computer's memory.

Feel free to start the Shell from within Windows. You can either make the Shell an icon in one of your Program Groups, or you can run the Shell from the command line. The DOS RENAME command enables you to change a file's name. It won't however, enable you to rename a directory or subdirectory. A quick way to do that is to use Windows File Manager. Highlight the name of the directory you want to change, and choose Rename from the File pull-down menu. Type in the new name and click OK to complete the process.

WINA20.386

Windows 3.0 required the WINA20.386 file to run in Enhanced mode under DOS 5.0. If you've upgraded to Windows 3.1 you can safely remove this file from your hard drive.

Starting Windows from the Command Prompt

To start Windows, you type WIN at the command prompt. However, you can start Windows different ways by adding different switches after the word WIN. Here's a look at the switches and what they do:

WIN /S or WIN /2 starts Windows 3.1 in standard mode.

WIN /3 starts Windows 3.1 in 386-Enhanced mode, but only if there's enough extended memory available.

WIN : bypasses Windows' opening screen, saving a second or two of idle time.

TROUBLESHOOTING

DOS 6 is designed to provide the technology necessary to make Windows perform at its best. If you encounter problems, perhaps the following tips can help.

When you are running Windows, do not use the following commands:

APPEND

DBLSPACE

DEFRAG

EMM386

FASTOPEN

MEMMAKER

MSCDEX

NLSFUNC

SMARTDRV

SUBST

VSAFE

CHKDSK with the / F option

If you use Windows exclusively, do not install DOS versions of Anti-Virus, Backup, or Undelete. The Windows versions of these programs require less disk space.

Your program will run more effectively if you do not use RAMDRIVE.SYS. This will free up more extended memory for Windows. You do not need RAMDRIVE.SYS if you plan to do a lot of printing.

Don't forget that the EMM386 setting in the CONFIG.SYS file take precedence over the memory settings in your Windows SYSTEM.INI file.

Be sure to remove HIMEM.SYS and SMARTDRV from your Windows directory. DOS6 Setup updated AUTOEXEC.BAT and CONFIG.SYS with the current versions of these two files which must reside in your DOS directory.

SMARTDRIVE BASICS

WHAT IS SMARTDRIVE?

SMARTDrive is a disk cache program that can dramatically speed up your system. Disk caches work by temporarily storing data from your applications in a special section of RAM called a cache. When your application needs that information again, it is recalled from the cache rather than from your hard drive. Because RAM operates much faster than your hard drive, your application works much faster when you are using a disk cache.

SMARTDrive can speed up disk operations by temporarily storing information that your application reads from the hard disk. It also can temporarily store information that must be written to your disk, such as information you change when you are using an application program. It later writes the information to the disk when your computer requires fewer system resources, such as when you are not typing.

Large disk caches can temporarily store more information in memory for later use. Thus, larger disk caches mean your computer operates faster.

SMARTDrive caches is placed in extended memory. Extended memory is memory in excess of 1M Byte.

USING SMARTDRIVE

Include the command for SMARTDrive in your AUTOEXEC.BAT file so that it is activated every time you start your computer. However, it also can be loaded from the command prompt. The syntax for SMARTDrive is:

SMARTDRV [cache drives] [element size] [initial cache size] [windows cache size] [buffer size] / [switches]

This might seem like a complicated syntax. But SMARTDrive lives up to its name. It examines your system when it loads and, in many cases, adjusts its settings accordingly. As a result, most users don't need to set parameters and switches. The following paragraphs discuss each element of the syntax.

If you don't specify drives to cache, SMARTDrive automatically applies read and write caches to all hard drives and only write caches to floppy drives.

CD-ROM and network drives are ignored. These options make sense in most situations. If you want to change the default, list the drive letter followed by + or -. The + enables read and write caching for the drive you designate, and the - disables all caching for a particular drive. For example, the command:

SMARTDRV B + D -

enables write caching for floppy drive B and disables all caching for hard drive D.

The element size is the number of bytes of information that SMARTDrive moves to and from the cache at a time. The options are 1024, 2048, 4096, and 8192 bytes. The default is 8192 bytes. Again, there should be no reason to change the default, although it might be useful in some cases in which conventional memory (memory below 1M) is very tight. That is because a small element of SMARTDrive is placed in conventional memory, and the amount of memory you designate for this parameter comes from that lower memory. Because the amount of memory involved is relatively small, do not change the default unless your lower memory is in extremely short supply.

The Windows cache size refers to the amount of that cache that is dedicated to Windows when you start Windows. As mentioned previously, the larger the cache size, the better. However, Windows requires extended memory for uses other than SMARTDrive. As a result, if you have 2M of extended memory and you devote all of it to SMARTDrive, you soon will run out of memory for other functions when you are in Windows.

Because finding the balance between initial cache size and Windows cache size can be confusing, SMARTDrive does the work for you. When you start SMARTDrive, it examines how much memory you have. If you have not set specific initial or Windows cache sizes, it automatically sets them as shown in Table 1 given below:

Table 1 SMARTDrive's default settings for initial cache size and Windows cache size.

Extended Memory	Initial Cache	Windows Cache
Up to 1M	All extended memory	0 (no caching)
1M to 2M	1M	256K
2M to 4M	1M	512K
4M to 6M	2M	1M
6M +	2M	2M

In most cases, there is no reason to change SMARTDrive's cache size settings. If you need to do so, however, simply put the value, in kilobytes, in the command line.

There are several switches for use with SMARTDrive. The /B and /Q switches are used when SMARTDrive loads. Use the other switches from the command line after SMARTDrive has been started to alter the way it operated or to get information about SMARTDrive.

Table 2 is a brief description of available switches for the SMARTDRV command.

Table 2. SMARTDrive switches.

Switch	Function
/B: bufffersize .	Specifies size of the read-ahead buffer, which allows SMARTDrive to read additional disk information. The default is 16K.
/C	Writes all information from the cache to the disk. Used from the command prompt if SMARTDrive already is loaded.
/L	Prevents SMARTDrive from loading into reserved memory.
/Q	Prevents SMARTDrive from displaying error and status messages when it loads.
/R	Writes the contents of the cache to disk and restarts SMARTDrive.
/S	Provides information about the status of SMARTDrive and statistics about how well it is functioning.

The /S switch is particularly useful for showing how effectively SMARTDrive is working. It provides information about how often information was used from the cache (called a cache hit) and how often information had to be used directly from the hard drive (called a cache miss). Even with small caches, there should be at least twice as many hits as misses. If your cache regularly falls below that mark, adjust the cache size and other parameters.

USING SMARTDRIVE WITH DOUBLE BUFFERING

In some cases, you might have to use a feature of SMARTDrive called double buffering. You might need double buffering if you run either the EMM386.EXE memory manager or Windows in enhanced mode and you also use:

- (a) A hard disk or other device that uses a SCSI (small computer system interface) or ESDI (enhanced system device interface) hard drive.
- (b) An MCA (microchannel architecture) device.

Double buffering provides compatibility between these devices and SMARTDrive. It is easy to find out whether you need double buffering by loading it and then checking to see whether SMARTDrive is using it. First, in your CONFIG.SYS file, add the line

```
DEVICE =C:\DOS\SMARTDRV.EXE/double buffer.
```

and restart your computer. At the command prompt, type SMARTDRV

You will see information about the operation of SMARTDrive. The heading in one of the columns of information is Buffering. If any of the entries in that column says Yes, you need double buffering. If one or more of the entries in that column use the - minus character, SMARTDrive could not tell whether double buffering was needed. In either case, leave the new command in your CONFIG.SYS file. Removing the entry saves you a little conventional memory.

NOTES ABOUT SMARTDRIVE AND MEMORY

SMARTDrive automatically loads itself into the reserved upper memory area if memory is available there. Because of that, you do not have to use the LOAD-HIGH command with SMARTDRV.EXE.

Because SMARTDrive caches are stored in extended memory, you must load an extended memory manager in your CONFIG.SYS file. In most cases, install the device driver HIMEM.SYS, which is included with DOS 6. If you use another extended memory manager, it must conform to what is called the Lotus / Intel / Microsoft / AST Extended Memory Specification (XMS).

USING RAMDRIVE

A RAM drive is a dedicated portion of RAM that works as a disk drive. Special device drivers loaded in the CONFIG.SYS file are used to set up RAM drives. When the drivers are loaded, your computer thinks it has an additional drive.

You can copy files to the RAM drive, create directories and subdirectories, or do virtually any task that you can do with an ordinary disk drive of that size.

There are two main differences between RAM drives and regular drives. First, because RAM drives are temporary drives, any information you place in a RAM drive really is a slight-of-hand trick that uses RAM, which is faster than a physical medium such as a hard drive. RAM drives are faster than regular drives.

Because RAM drives are faster, they can play a role in speeding up your system. For example, if you have an application that is particularly slow, you might be able to speed it up by loading it in a RAM drive. Consult your application's documentation to find out whether the program supports this and, if so, which files must be placed in RAM drive. Another way to improve system speed—although it can be risky—is to place large data files in a RAM drive. With some applications, large files can be cumbersome and require a lot of disk accesses, which can slow down your system quite a bit. Placing the file in a RAM drive can speed things up. Any information you save to a RAM drive disappears when you turn off your computer. Make sure you frequently save data files located on a RAM drive to a physical hard disk.

DOS 6 includes the RAMDRIVE.SYS device driver for creating a RAM drive. To use it, load it in your CONFIG.SYS file. The syntax is:

DEVICE = RAMDRIVE.SYS [disk size] [sector size] [number of entries] /switches

Disk size refers to the size of your RAM drive in kilobytes. If you do not specify a size, RAMDrive creates a 64K RAM disk. A RAM drive can be as large as the memory you devote to it. Sector size refers to the size of each sector on the drive. You can use any size up to 512 bytes, which is the default.

Number of entries refers to the number of files you can place in RAM drive's root directory. You can use any number between 2 and 1024, although the default of 64 entries is used if you do not specify a number. The /E switch places the RAM drive in extended memory. The /A switch places the RAM drive in expanded memory. If you don't use extended or expanded memory, RAMDrive uses conventional memory, which typically is in short supply. You can have as many RAM drives as you want. Your only limitation is available memory.

Remember, it is risky, but sometimes useful, to place data files in a RAM drive. If you do this, see whether the application that created the data files supports macros to automate multiple keystroke operations. If so, develop a macro that saves the data file both to your physical hard drive and to your RAM drive in the same operation. Use the macro whenever you save your file to minimize your risk of losing data stored in your RAM drive.

COMMUNICATING WITH MODEMS AND FAX

MANAGING YOUR STANDARD DEVICES

If you need to communicate with remote computers via the telephone lines, you have two alternatives:

- (a) Install a modern (short for MOdulator/DEModulator), which allows two computers to send and receive data and programs.
- (b) Buy a FAX board, which allows a computer to send and receive text and graphics (but not programs) to and from any FAX machine or any other computer with a FAX board.

COMMUNICATING WITH MODEMS

A modem is the most flexible means of sending data and programs from one computer to another. You also need a modem to communicate with large external database services.

The Baud Rate Feature

Perhaps the single most important feature to consider when purchasing a modem is the *baud* rate. The baud rate is the speed at which data is sent and received (measured in bits per second). The most common baud rates used in serial communications (that is, transmissions through phone lines) are 300, 1200, 2400, and 9600 baud.

A modem's listed baud rate is its maximum rate of data transfer. Hence, buying a modem that can transmit and receive at 9600 baud provides the most flexibility for communicating with all other modems, both fast and slow.

Selecting Communications Software

A modem also requires communications software that manages the streams of data being sent and received by the connected computers. Two major types of communications software are available for modems. With the standard communications packages, you can perform basic communications operations, such as sending and receiving files.

Most modems are packaged with their own communications software. However, that software might offer only limited operations, especially compared to some of the more widely used communications packages available from independent software dealers. You might select one of the following:

- (a) Crosstalk Mark IV
- (b) Crosstalk XVI
- (c) Crosstalk Communications
- (d) 1000 Holcomb Woods Parkway
- (e) Roswell, GA 30076-2575
- (f) ProComm Plus
- (g) Data Storm Technologies, Inc.

If your job entails writing programs for others to use or training people to use computers, you might need to use a remote access software with your modem rather than the standard communications Packages. You can use these programs not only to send and receive files but also to control a remote computer from your own computer or watch the activity of a user on a remote computer. Here are a couple of vendors of remote access software.

- (a) Carbon Copy
- (b) Carbon Copy Plus
- (c) PC Anywhere

Modem Setting for Best Performance

The real trick to using a modem effectively is ensuring that the two communicating computers use the same settings for sending and receiving files. You can use your communicating with other computers:

Baud Rate	Usually 300, 1200, 1400, 4800 or 9600
Parity	None, Odd, Even, Mark, or Space
Data Bits	5, 6, 7, or 8
Stop Bits	1 or 2

The *Parity* setting represents the characters used to detect errors during communications. The *data* bits setting establishes the number of bits used to represent each character of transmitted data. The stop bits setting represents the number of bits used to separate groups of data bits.

Perhaps the most common setting used for sending and receiving files is 1200 N-8-1, which is an abbreviated way of expressing 1200 baud, None (parity), 8 data bits, and 1 stop bit. A common setting for communicating with remote database services is 1200 E-7-1 (1200 baud, Even parity, 7 data bits, and 1 stop bit).

If you're not sure of the proper settings when you first access a remote computer, either one of these settings is a good first try. Again, adjusting the settings for communications via modem is a matter of using your communications software correctly.

COMMUNICATION WITH FAXS

A second way of communicating via telephone lines is through facsimile transmission (FAX). The beauty of FAX is that it enables you to communicate with a world wide network of FAX machines and other computers with FAX boards without having to worry about settings such as baud rate, parity, and stop bits.

Selecting a FAX Board

The FAX standard for facsimile transmission has changed a few times throughout the years. Currently, The most widely used is called Group 3, although a new standard (Group 4) is emerging. When you select a FAX board for your computer, try to select one that supports at least Group 2 and Group 3 standards.

Using a FAX board in your computer is not exactly like owning a complete FAX machine. The main reason is that a FAX board can send and receive only files, not text or graphics that are already printed on paper. If you want to be able to send printed text, as well as files, you need to invest in an additional *scanner*. You need to by a machine that supports both paper and computer file transmissions.

FAX Users Beware

Be aware that, unlike with modems, when you receive a file via FAX, it is not a simple text file that can be edited with your word processor. Instead, it's a graphic file that can only be viewed and printed with certain programs. Therefore, if you need to transmit editable text from one location to another, a modem is preferable to a FAX board.

The same is true of scanners. They are a great way to "capture" printed graphics, diagrams, logos, signatures, and to use them in your printed documents. However, the text they capture will probably be inaccessible to your word processor or other text editor. There are programs that can translate scanned text to editable ASCII files, but they tend to be expensive, slow, and only partially accurate.

Caution

The most common problem modem users experience is failure to connect. You must ensure that the two communications computers use the same settings for sending and receiving files. Check the baud rate, parity, number of bits, and stop bits to be sure they are set the same on both computers. If you need to transmit editable text from one location to another. Then it is preferable to use a modem instead of FAX.

Appendix L

GLOSSARY

386 Expanded mode The most advanced of Windows' operating modes. In this mode, Windows accesses the protected mode of the CPU chip for extended memory management and multitasking of both Windows and non-Windows applications.

active partition The section of a hard disk containing the operating system to be used when the hardware powers up.

allocation The assignment of memory locations during the creation of graphical objects.

ANSI character set The 256 characters defined by 8-bits codes by the American National Standards Institute.

application program A program that performs a specific task or group of tasks for the user, such as word-processing, or inventory management programs.

arrow keys The four directional keys that control cursor movement.

ASCII American Standard Code for Information Interchange, the coding scheme whereby every character the computer can access is assigned an integer code between 0 and 255.

attribute A characteristic (or property) of a disk file. Also used in DTP for the characteristic of a font.

AUTOEXEC.BAT A batch file executed automatically whenever the computer is booted up.

batch program (or batch file) An ASCII file containing a sequence of DOS commands that will execute the commands when you invoke it.

baud rate The speed of data transmission, usually in bits per second.

binary A numbering system that uses powers of the number 2 to generate all other numbers.

bit A bit is a binary digit, either 0 or 1.

bitmap A graphic file containing bitmapped information.

bitmapped font Any character font which is fixed in size, device specific, and stored as a group of bit values (i.e., a *binary*).

boot record The section on a disk that contains the minimum information DOS needs to start the system.

bootstrapping When the computer is turned on or is rebooted from the keyboard with Ctrl + Alt + Del keys pressed together, it loads enough of its operating system into memory to get started; it "pulls itself up by its bootstraps program.

branch A subportion of a directory tree.

buffer An area in memory set aside to speed up the transfer of data, allowing blocks of data to be transferred at one time.

bus The circuit lines used for transferring data between various components of a command system.

byte The main unit of memory in a computer. A byte is an eight-bit binary-digit number. One character usually takes up one byte.

cartridge font A font that is included within a cartridge that slides into a printer slot. It has the advantage of a hardware font, but is not usually included with the original printer.

CD-ROM Compact Disk Read-Only Memory. A storage device that records data for retrieval by means of a laser beam rather than magnetically.

character set A complete group of 256 characters that can be used by programs or system devices. It consists of letters, numbers, control codes, and special graphics or international symbols.

click To press and immediately release a mouse button.

clipboard The name given to the memory area assigned to temporary storage duties for information transfer between applications.

cluster A group of contiguous sectors on a disk. This is the smallest unit of disk storage that DOS can manipulate.

code page A character set that redefines the country and keyboard information for non-U.S. keyboards and systems.

COMMAND.COM The command processor that interprets your internal and external command requests.

command prompt A visual indicator that DOS is waiting for input from you.

composite video A video signal that contains all necessary color and timing information in a single input line.

compression ratio A multiplicative factor that estimates how much file space can be squeezed onto a physical disk drive using the compression technology of the DBLSPACE facility in DOS 6.

CONFIG. SYS An ASCII text file containing system configuration commands.

configuration An initial set of system values, such as the number of buffers DOS will use, the number of simultaneously open files it will allow, and specific devices that will be supported.

console The combination of your system's monitor and keyboard.

contiguity The physical adjacency on a disk of the disk sectors used by a file.

control codes ASCII codes (from 0 to 31) that do not display a character but perform a function, such as beeping or deleting a character.

conventional memory Physical memory located below the 640K addressing limit of DOS.

copy protection Special mechanism contained in diskettes to inhibit the copying of them by conventional commands.

CPU Central Processing Unit. The main chip that executes all individual computer instructions.

current directory The directory in which file operations initiated from a command prompt or a Run line will be carried out unless another directory is specified.

cursor The blinking line or highlighting box that indicates where the next key-stroke will be displayed or what the next code entered will affect.

Cut To remove the selected text or graphics from an application window, and store a copy of it in the Clipboard.

cutting and pasting Selecting a portion of one screen window and making a copy of it in another portion of the same window, or in a completely different document or application's window.

data disk A disk that can contain only data; no room has been reserved for system files.

data file A named storage area, used by applications to store a group of related information, such as a spreadsheet. Also called a document.

debugging The process of discovering what is wrong with a program, where the problem is located, and what the solution is.

default printer The active printer used by software applications when the Print command is selected.

defragmentation Rearranging the location of files stored on a disk into contiguous clusters in order to make the data in those files more quickly retrievable.

delimiter In data files, special character, such as a comma or space, used to separate values or data entries.

destination The targeted location for data, files or other information generated or moved by a DOS command.

device Any internal or external piece of peripheral hardware.

device driver A special program that must be loaded at the time of booting to use that device.

device name Logical name that DOS uses to refer to a device.

dialog box A rectangular window that displays information and usually prompts you to make choices or to enter data.

differential backup A type of backup that copies all files that have either been created or modified since the most recent full backup.

digital A representation based on a collection of individual digits, such as 0's and 1's in the binary system.

Direct Memory Access (DMA) Very fast transfer of data between computer memory and a peripheral device (e.g., a disk drive) using a dedicated high-speed I/O channel.

directory A named group of files on disk. As part of DOS's file management structure; this group may include other directories or subdirectories.

directory path A combined sequence of directory names that locate a particular file on a disk. Also called a *full path* or a *pathname*.

directory tree A graphic depiction of the directories and subdirectories that represent the organization of files on a disk.

disk cache A portion of memory reserved for the contents of disk sectors. It facilitates faster repeated access of the same sectors, as well as often enabling faster access of subsequently referenced sectors. It can be implemented with the SMARTDRV.EXE device-driver program.

disk drive A hardware device that accesses the data stored on a disk.

diskette A flexible, iron oxide-coated disk used to store data. It is also called floppy diskette.

disk optimizer A program (such as DEFRAG.EXE in DOS 6) that rearranges the location of files stored on a disk in order to make the data in those files quickly retrievable.

display adapter An add-in hardware board that sends video output signals to your monitor corresponding to the current contents of video memory.

display box A window that shows the current status of various selectable options.

DOS Disk Operating System. The main disk and file-management software that facilitates computer/user interaction.

DOS environment A part of memory set aside to hold variables used by DOS and application programs, such as COMSPEC, PATH, and LASTDRIVE.

DOS memory Some items used to refer to the first 64K of conventional memory that is used by typical DOS application.

dot pitch The size in millimeters of each pixel on a video monitor. The smaller the dot pitch, the higher the allowable screen resolution and clearer the colors.

double-click Pressing a mouse's button twice in rapid succession.

double-density diskette A diskette on which magnetic storage material is arranged twice as densely as was true on the first available DOS diskettes, allowing the storage of twice the former amount of data.

downloadable font A printer font that can be copied from a disk file, or from system RAM, into a printer's memory. Also called a *soft font*.

draft quality An output technique that uses fewer pixels, dots, or display/printing features in order to improve output performance.

DRIVER.SYS A CONFIG.SYS device driver used to facilitate assigning logical-drive identifiers to extra physical-disk drives.

EDIT DOS's primary full-screen editor.

EMM Expanded Memory Manager. A device driver that manages access to expanded memory, using either the physical characteristics of a particular memory board or the facilities of the 80386/80486 chip to emulate expanded memory.

EMM386.EXE A device driver for 80386 and 80486 computers that manages the allocation of upper memory blocks, as well as the emulation of expanded memory from available extended memory.

executable file Any "runnable" application program with a file extension of .COM, .EXE, or .BAT. The term is sometimes extended to include files that don't run by themselves but do contain program code, such as .OVL and .PIF files.

expansion cards Add-on circuit boards through which hardware can increase the power of the system, such as adding extra memory or a modem.

expansion slots Connectors inside the computer in which expansion cards are placed so that they tie in directly to the system.

extended ASCII codes ASCII codes between 128 and 255, which usually differ from computer software to computer software.

extended DOS partion A hard-disk DOS partion, beyond the first hard disk drive C:, which can be divided into further logical disk drives (D:, E:, and so on).

extended memory Additonal physical memory that offers general purpose support beyond the DOS 1Mb addressing limit for 80286, 80386, and 80486 computers. It also enables Windows to support multiple, simultaneously initiated programs.

extended memory manager Any device driver (e.g., HIMEM.SYS) that manages and facilities the use of extended physical memory.

extension The one to three characters after the period following the base name in a file specification.

file A collection of bytes, representing a program or data, organized into records and stored as a named group on a disk.

file attribute One of several file status values that denote whether or not the file is read-only, system, hidden, or archived.

file allocation table (FAT) A table that records which clusters on a disk are being used, are empty, or are bad.

file fragmentation The storage of a file's clusters in noncontiguous disk locations.

File Manager The main Windows application program for managing files and disk structures.

fixed disk IBM's name for a hard disk.

flicker A monitor image problem casued by insufficient video rewrite speed to create a steady image.

font A grahic style applied consistently to all letters, numbers, and symbols in a character set.

font catridge An electronic casing that plugs into a printer slot and which contains a set of hardware fonts in read-only memory.

font family A group of individual fonts, all of which display the same overall contains characteristics (e.g., all sans serif characters).

footer Repeating text located at the bottom of document pages.

format The layout and appearance of an output document.

formatting The placement of timing marks on a disk to arrange the tracks and sectors for subsequent reading and writing.

fragmentation A condition in which many different files have been stored in noncontiguous sectors on a disk.

frame one complete video image.

full backup A type of backup that copies all files. The archive bit is turned off to indicate that the files have been backed up.

function keys Special-purpose keys on a keyboard, which can be assigned unique task by DOS or by application programs. Also referred to as the F keys.

graphical resolution The degree of detail (expressed as number of dots) used to display or print any image. Higher resolutions require special purpose video or printer equipment, and invariably require more time to construct.

hard disk A rigid platter that stores data faster and at higher density than a floppy diskette. It is sealed in an airtight compartment to avoid contaminations that could damage or destroy the disk.

hardware The physical components of a computer system.

header Repeating text located at the top of document pages.

help Helpful textual information, obtained by selecting a choice from the help menu or by pressing F1. Help text obtained by pressing the F1 key is context-dependent, relating directly to whatever item is currently highlighted.

help file A file of textual information containing helpful explanations of commands, modes, and other on screen tutorial information.

hidden attribute A bit in a file specification used to indicate whether the file in question is to be hidden from view and from all commands that search the DOS directory table.

hidden files Files whose names do not appear in a directory listing. This term usually refers to DOS's internal system files, disk-labeling file, deletion-tracking file, and partition-table image file. It can be referred to certain files used in copy-protection schemes.

HIMEM.SYS The extended memory (XMS) memory manager used by both DOS and Windows.

incremental backup A type of backup that copies all files that have either been created or modified since the most recent full or incremental backup. The archive bit is turned on to indicate that the files have been backed up.

internal command One of the following memory-resident commands that are part of the DOS COMMAND.COM file:

BREAK,	LOADHIGH,
CALL,	MD,
CD,	MKDIR,
CHCP,	PATH,
CHDIR,	PAUSE,
CLS,	PROMPT,
COPY,	REM,
CTTY,	REN,
DATA,	RENAME,
DEL,	RMDIR,
DIR,	SET,
ECHO,	SHIFT,
ERASE,	TIME,
EXIT,	TYPE,
FOR,	VER,
GOTO,	VERIFY,
IF,	VOL, and
LH	

interrupt A signal sent to the computer from a hardware device, indicating a request for service or support from the system.

laser printer A printer that produces image (pictures or text) by shining a laser on a photostatic drum, which picks up toner and then transfers the image to paper.

logical drives Disk drives, created in an extended DOS partition, that does not physically exist, but DOS thinks they do.

LPT port A parallel communications port. Windows supports up to three such ports, which are named LPT1, LPT2, and LPT3.

machine language The most fundamental way to program a computer, using instructions made up entirely strings of 0's and 1's

macro A set of memory-resident commands or actions that can be named and executed as a group, similar to the disk-resident mechanism known as batch files. The DOSKEY utility provides this service under DOS.

memory The circuitry in a computer that stores information.

memory cache Data stored in a very fast type of memory (usually Static-Column RAM chips) that provide faster access to standard memory (usually Dynamic-RAM) locations.

menu A set of command choices displayed in tabular format.

menu command A selectable word or phrase that appears on an application-program menu.

microfloppy diskette the $3\frac{1}{2}$ " diskette.

modem A device that transmits digital data in tones over a phone line.

monitor The device used to display images; a display screen.

monochrome Using two colors only-the background and foreground.

mouse A device that moves the screen cursor in imitation of the movement of the device itself.

mouse pointer The screen symbol representing the symbolic location of the mouse. When in graphic mode, the mouse pointer is generally an arrow. When in text mode, it appears as a solid movable rectangle.

multimedia Any applications that employ sound, graphics, or video in combination with text information.

multitasking The execution of two or more computing applications simultaneously.

network Several computers, connected together, combined with specially designed software that facilitates sharing of common data files and peripheral devices.

non-Windows application Any application that was not designed to use the windowing features or internal facilities of Windows. Typically, this refers to older DOS applications that may or may not have a Windows version available.

OS/2 IBM's Operating System/2. An advanced 32-bit multitasking, multithreading operating system.

overlay area A portion of memory reserved for storage and execution of overlay-file instructions.

overlay files Files containing additional command and control information for sophisticated and complex programs. An overlay file is usually too large to fit into memory along with a main .EXE or .COM file.

Paging A feature of 80386 (and successor) processors that organizes all possible memory into 4K blocks. Each block is assigned a table-resident base address (which effectively maps the virtual address location into available memory addresses) and an access status (e.g., paged to disk).

parallel port Any one of three computer connections (named LPT1, LPT2, or LPT3) used for parallel communications.

parameter An extra item of information, specified with a command, that determines how the command executes.

partition The section of a hard disk that contains an operating system.

password A sequence of characters that allows entry into a restricted system or program.

paste To copy the contents of the *clipboard* into the insertion point of the current application.

path The list of disks and directories that DOS will search through to find a command file ending in .COM, .BAT, or .EXE.

peripheral Any physical device connected to the computer. Redirecting the input or output of one program or command to another program or command by means of the | symbol.

pixel The smallest unit of display on a video monitor—in short, a dot—which can be illuminated to create text or graphics images.

plotter A device that draws data on paper with a mechanical arm.

pointer The on-screen graphic representation of your mouse's location and status. Generally, the pointer is an arrow, although it changes appearance according to the task that an application (or Windows) is performing.

pop-up program A memory-resident program that can be activated (i.e., popped up) while another application is running, by pressing a predefined hotkey.

port A computer connection for transferring data to and from external devices.

primary DOS partition The first, logically named disk portion of a hard disk. Contains the boot record and other DOS information files.

printer driver The software program that manages the control interface between your computer and a particular printer.

print manager The Windows application program that manages spooled output to your printer for all Windows applications.

program file An .EXE, .COM, .BAT, or .PIF file that can run an application program.

protected mode The principal operating mode of an Intel 80286, 80386, or 80486 chip that supports multitasking, process protection, and advanced memory management.

queue A series of files waiting in line to be processed.

RAM Random-Access Memory. The part of the computer's memory to which you have access; it stores programs and data while the computer is on.

RAM disk An area of RAM that acts as if it were a disk drive. All data in this area of memory is lost when the computer is turned off or warm booted. It is also known as a virtual disk.

read-only attribute A file with this attribute set in cannot be updated or deleted, but can still be read.

reserved memory System memory (between 640K and 1 Mb) normally used only for video buffers. DOS can use it (with appropriate system configuration) for device drivers, memory-resident programs (TSRs), and ordinary application programs.

resolution The density of dots per inch of a printer or video monitor.

ROM Read-Only Memory. The section of memory that you can only read from. This contains a small portion of the basic computer operating system, as well as certain hardware-support routines.

root directory The first directory on any disk.

screen capture To store a copy of the current screen image or active window image in the Clipboard or in a disk file.

sector A division of a disk track; usually 512 bytes.

serial port A connection between your computer and one of up to four separate serial data devices. The port is labeled COM1, COM2, COM3, or COM4 for software access.

server On a network, a computer and shared device (typically a printer or disk drive) that processes requests from multiple nodes (computers) on the network. Also, a computer (often a desktop) that provides access to files on this computer's physical drives via the INTERSVR program to a connected (i.e., client) computer. The two computers must be connected by a compatible cable between like parallel or serial ports.

shell An application program that enables you to select and execute other application programs.

SMARTDRIVE.SYS A disk-caching device driver that improves disk access and overall Windows performance.

spooling Simultaneous Peripheral Operations On-Line. Using a high-speed disk to store input to or output from low-speed peripheral devices while the CPU does other tasks.

standard mode The Windows operating mode that provides task-switching ability, supports access to protected-mode operations, and access to as much as 16Mb of extended memory. It does not allow for multitasking of non-Windows applications (but does allow context switching).

subdirectory A directory contained within another directory or sub-directory. Technically, all directories other than the root directory are subdirectories, though those at the first level are usually referred to as directories.

swap file In 386 Enhanced mode, a disk file used to store information about running applications that have been temporarily suspended from execution.

switch A parameter included in DOS commands, usually preceded by the slash (/) symbol, which clarifies or modifies the action of the command.

system attribute A bit in a file specification used to indicate whether the file in question contains special system information.

system disk A disk containing the necessary DOS system files for system booting.

SYSTEM.INI The Windows initialization file that specifies characteristics of the hardware and internal operating environment.

Tagged Image File (TIF) The TIF Format (sometimes known as TIFF) is a graphics format used by most scanner and page layout applications. It includes compression techniques, and the ability to store multiple images in a single file. It provides color, gray-scale, and black-and-white capabilities.

template The 127-character memory buffer in which DOS stores a copy of the most recent command-prompt entry.

text file Any file that consists only of characters in the 256-character ASCII set.

TrueType fonts (Windows) Fonts under Windows 3.1 and higher that can be sized to any height to appear the same on the printed page as they appear on your screen. Depending on your printer, a TrueType font may be generated as a bit-map or as a soft font.

utility A supplemental routine or program designed to carry out a specific operation, usually to modify the system environment or perform housekeeping tasks.

Virtual memory (Windows) In 386 Enhanced mode, the apparent (but not actual) memory available to running applications.

virus A small block of coded instructions that obtains control of your computer's CPU and directs it to perform unusual and often destructive actions.

VMM Virtual Memory Manager. The management code built into Window's 386 Enhanced Mode for managing the virtualization of memory addresses, using a page table to map logical application pages to actual physical memory pages.

volume label A one to eleven character name for identifying a disk. You can assign whatever label you want to a disk during a FORMAT operation or after formatting with the LABEL command.

warm booting Resetting the computer using the Ctrl + Alt + Del key combination.

wild card A character or characters used to represent other characters. In DOS, * and ? are the only wild-card symbols.

window A rectangular portion of the screen that forms the fundamental graphic area within which Windows and analogous environments display information about applications.

Windows shell The graphic interface, which uses menus, windows, and icons, and facilities both file and program management.

write-protecting Giving a disk read-only status by covering the write-protect notch on a 5 1/4" diskette, or by sliding the write-protect switch on a 3 1/2" diskette to a see-through position.

WYSIWYG What You See Is What You Get. An acronym that stands for the ability to print data that appears on paper exactly as it appears on your screen.



Function	Command to Use
Print a file from DOS	PRINT
Protect files on a network	SHARE
Protect the system from viruses	VSAFE
Prolong battery life	POWER
Recover an accidentally erased file	UNDELETE
Recover from an accidental disk format	MIRROR, UNFORMAT
Redirect parallel output to serial	MODE
Remove a computer virus	MSAV
Remove an empty subdirectory	RD, RMDIR
Return from a secondary processor	EXIT
Run a subroutine in a batch file	CALL
Send graphics characters to the printer	GRAPHICS
Send screen output to a remote terminal	CITY
Set the time	TIME
Shift the screen display right or left	MODE
Skip lines in a batch file	GOTO
Sort data	SORT
Speed up the system	DEFRAG, FAST-OPEN, SMARTDRV
Stop the screen from scrolling	Ctrl-S, MORE
Suppress batch file line display	ECHO OFF

Function	Command to Use
Suspend batch file processing	PAUSE
Backspace cursor	Ctrl-H, Backspace
Bypass CONFIG.SYS and AUTOEXEC.BAT on startup	F5
Cancel a DOS command	Ctrl-C
Cancel command line changes	Esc, Ctrl-X
Delete a character in a command	Delete
Edit the previous command	F2, F4
Insert a character in a command	Insert
Pause command processing	Ctrl-S
Pause CONFIG.SYS processing, line by line, on startup	F8
Repeat a command, by character	F1
Repeat a command, by line	F3
Send screen output to printer	Ctrl-P, Shift-PrtScrn

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THOMAS,R	DOS (3.3 & 5) INSTANT REFERENCE	45.00
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